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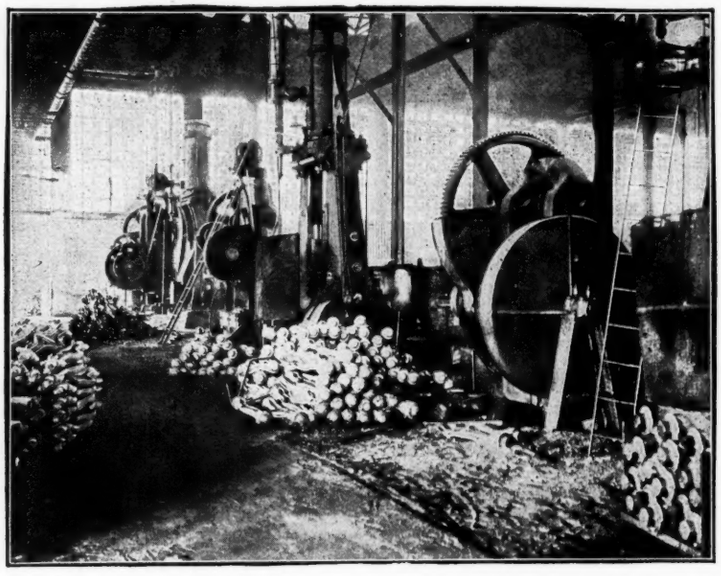

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AUTOMOTIVE INDUSTRIES
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VOL. XLIV NEW YORK—THURSDAY, MARCH 10, 1921 No. 10

How Can Automotive Production Costs Be Lowered?

This is not the complete answer, but it is one answer by a man who has studied production in most of the large shops of the industry. Interesting discussion of progressive and departmental manufacture.

By George M. Meyncke*

MANY economists, after a profound study of the recent stagnation period, have agreed on a verdict. It is that overproduction is practically impossible—it is merely underconsumption that we suffer from. The Public, they explain, are merely depriving themselves of their wants because of the delays they suffered and the prices they paid in addition to the suffering.

It is true that the Public has been plunged from a feverish urge to stop purchasing because there was not enough goods to go around, to the frigid plea of "Buy Now" campaigns.

It is scant wonder that there is indecision in the minds of the automobile builders as to which is the dream and which the reality, and no doubt we will continue to swing pendulum-like back and forth between the two extremes unless all phases of the automobile industry bend their efforts toward stopping the pendulum somewhere near its perpendicular position.

A local distributor has informed me that several of my neighbors want to buy a car and will do so "when prices come down." These neighbors are obeying to the letter of the law the now extinct solicitation to stop purchasing and they refuse to be excited by the "Buy Now" appeal.

*With the Oesterlein Machine Co.

This is but a concrete example of a problem that is staring all manufacturers in the face. That is, the problem of producing and marketing their products at a price which can be paid by those who are anxious to obtain their products.

Production Costs

On the surface it would seem that the limit has about been reached in the automobile industry from the production end. The industry includes the world's greatest producers. What production problems are left to be solved? How can production costs be lowered?

This can be answered generally in one sentence.

The automobile manufacturer is behind the times from the shop equipment standpoint and is not in a position to avail himself of the best the machinery market offers.

This extreme statement is probably contrary to the common understanding and calls for explanation.

The machine tool industry has confronted and is ready to emerge from an unusual position. Unlike the automobile, its production was encouraged instead of curtailed during the war and thousands of new tools were built and put into service. A machine tool stays in service many years. Tools in use that are thirty years old are not uncommon.

Generally speaking, the same tools built during the war are in use to-day in automobile shops.

However, during and after the war, the machine tool builders have attacked the problem of reselling their old market by the introduction of more productive tools. A concrete example may make this point clear.

There were approximately 2,250,000 passenger cars built in 1920 and in them approximately 11,000,000 connecting rods were used. If these 11,000,000 connecting rods were all made in one shop, a certain one of the essential machining operations would require 132 of the best of machines (on a 2000 working-hour-year basis) made prior to the war, whereas it would be possible to machine them on 45 of the modern machines available to-day.

By actual count in ten large shops and the proportioning of their production to the total yearly production, there were, instead of the theoretical 132 "old style" machines, a total of 786 machines used to get out the 1920 production of this operation or almost six times the number necessary for the theoretical centralized connecting rod shop.

To rework the field for that particular operation on connecting rods, the old machines can be replaced by the new at the ratio of about three to one.

Incidentally, this could be the foundation of argument for the parts manufacturer with very fine specialization of products such as a connecting rod company, with an ambition to supply the entire industry.

When the production ability of some of these new tools is studied, the real scope of their cost lowering value is apparent. They are not confined to any one class of work as is evident from the following.

There is a grinder capable of grinding operations on small hardened parts at the rate of over one million parts per year. There is a milling machine capable of milling parts, such as yokes, at the rate of one million per year. There are drilling machines capable of drilling fairly large holes at the rate of half a million holes per spindle per year.

Specialized Machine Tools

Such machine tools are commonly classified as "specialized tools." There is a fine hair distinction between them and the so-called "special machines" in that the former are the developed product of machine tool builders and the latter are odd machines built for a single fixed purpose.

The general plan followed in specialized machine tools has not been to build the older machines in duplex or triplex and thus multiply the output per machine, but to employ but a single cutting or abrasive tool and make it capable of greater output, or in other words, to design around the actual ability of a single stock removing medium at more or less of a sacrifice of the versatility of the old machines of general application.

When this idea is successfully carried out production increase is obtained with a corresponding decrease in maintenance.

The automobile manufacturers have stimulated and even assisted in the development of much of this new order of production machinery and where they have not actually assisted the automobile manufacturer has furnished the market for the manufacturer who developed his tools unaided.

Some new shops have fortunately been in a position to start with much of this new equipment. As a whole, however, the manufacturers have not seized the opportunity of lower production costs which these new tools make possible. There are both actual and fancied disadvantages that operate against the installation of such machinery.

The automobile industry is much more responsive to improvements than others. They have witnessed such rapid development in their own product that they even anticipate it in other industries. Recently the idea has grown that the curve of progress has reached its peak and will hold a flat for some time. Whether this is true of the automobile itself or not, the writer is not in a position to say. On the question of production machinery, he believes that the high point is yet to come. Witness the new production machinery that has been announced since the war and which is augmented almost weekly as new ideas are perfected.

There are frequently fixed ideas in the minds of production engineers as to the ultimate possibilities in production and these ideas are set too near the limits of past practice.

Progressive Manufacture

Perhaps the greatest actual handicap to new machinery is the almost universal use of progressive manufacture. The mere idea that progressive manufacture shows symptoms of inadequacy is received with consternation by its advocates.

Progressive manufacture, from the machining standpoint, consists of the grouping of all machines required to make, say a universal joint, in a universal joint department, in charge of a foreman responsible for each machining operation necessary to complete the joint.

When one or more machines are required for milling or drilling as many joints per day as the schedule requires, this system is excellent. Suppose, for example, that the schedule calls for production at the rate of 200 universal joints per day and one milling machine and one drill are capable of that output. Each operator is kept busy at his particular machine and there is no accumulation of parts. Now suppose this equipment is replaced with a milling machine capable of producing at the rate of 140 universal joints per hour or 1120 per day.

This means that in less than two hours the output of the department is completed as far as that operation is concerned. The more capable machine is idle three-fourths of the time and a possible saving of production costs is not obtained.

Another job, say the steering knuckle, could be run on these machines when the universal joint output is completed. But this is impractical, because steering knuckles are made in the steering knuckle department under a steering knuckle foreman, who is indifferent to the worries of the universal joint foreman.

Departmental Manufacture

Progressive manufacture displaced departmental manufacture. With this system all chucking lathe work was done in the chucking department under a chucking lathe foreman, and all drilling in the drill department under a drill department foreman.

There are some classes of work, such as automatic screw machine, and frequently grinding, that, because of the skill and close supervision required, have always been handled departmentally.

In reality the introduction of specialized machinery is merely putting other machining operations at par with such classes of work that have previously been inapplicable to progressive manufacture.

To realize on the lower production costs offered by such machinery progressive and departmental manufacture is subject to review and revision from a cost per piece basis.

Foremen will never agree to combine. There is a fear of self-elimination. During the recent rush for production, such a change in system was impossible. To-day it is a cost reducing problem for the management as a whole.

Production Department Investments

Production engineers are not hired primarily to search for investments. In defense let it be said that they are not supervised from the "interest on our money" basis. They think and talk output limits and are ever increasing schedule from the equipment at their command.

In figuring a possible savings on equipment, their minds run in the single channel of saving operators' wages. They do not count the cost of supervision, floor space, upkeep, power, belts or motors and the endless little things that the auditors know as items of overhead that indirectly affect the cost of the finished product.

In considering the replacement of present equipment with more modern equipment, it may result in worthy gains for the auditor to sit in with the equipment committee having an eye for the production department investments so often discussed at such committees.

Unless the producer of comparatively small quantity can utilize more productive equipment, the gap between his costs and the large quantity producers will widen, a fact that reacts against his reaching the desired quantity goal.

Some shops maintain what are called "Flying Squadrons." These consist of capable men who are plugged in at whichever department lags behind the schedule and requires their assistance. Instead of continuing with slow equipment, the small shop can enlarge upon the "flying squadron" idea and progress their men to the equipment on which they can produce to greater advantage.

There is also a tendency to keep one machine constantly on a certain job. There is a point at which the potential possibilities of production become so great that changing from job to job on a single machine results in a lower cost per piece.

Making use of more productive machinery in the low quantity shop is more of a problem of tool and fixture design and of the training of operators than in the high quantity shop.

The grouping of similar parts and standardizing on fixtures makes possible the utilization of high production machinery, but also necessitates the training of more men to change equipment and to set up machines.

There is opportunity for the combined efforts of the engineering and production departments in a study of parts from the standpoint of material and processes of manufacture. Parts from sheet metal, for example, can now be made cheaper in some cases if castings or forgings are used in connection with the latest developments in machining methods. The relation between the number of operators and the cost of machining differs as improvements in handling operators are developed.

Standardization Work in Belgium

THE Association Belge de Standardisation was formed in April, 1919, in order to study the question of standardization from the commercial and technical points of view in all branches of industry. It consists of important technical and industrial associations in Belgium. A general committee has been chosen to direct the activities of the association, to examine any proposals presented and to keep in touch with similar organizations in foreign countries, in order that the members of the association may profit from results obtained elsewhere, or may, if required, assist in the establishment of international standardization. In each case where the committee decides to attempt standardization, it will appoint a "Technical Committee" of experts, who will report and if necessary consult individual producers and consumers.

A good example of British coach work. Interior drive limousine body on the 25-hp. Vauxhall chassis recently described in AUTOMOTIVE INDUSTRIES

Five Models Included in New Line of G. M. C. Trucks

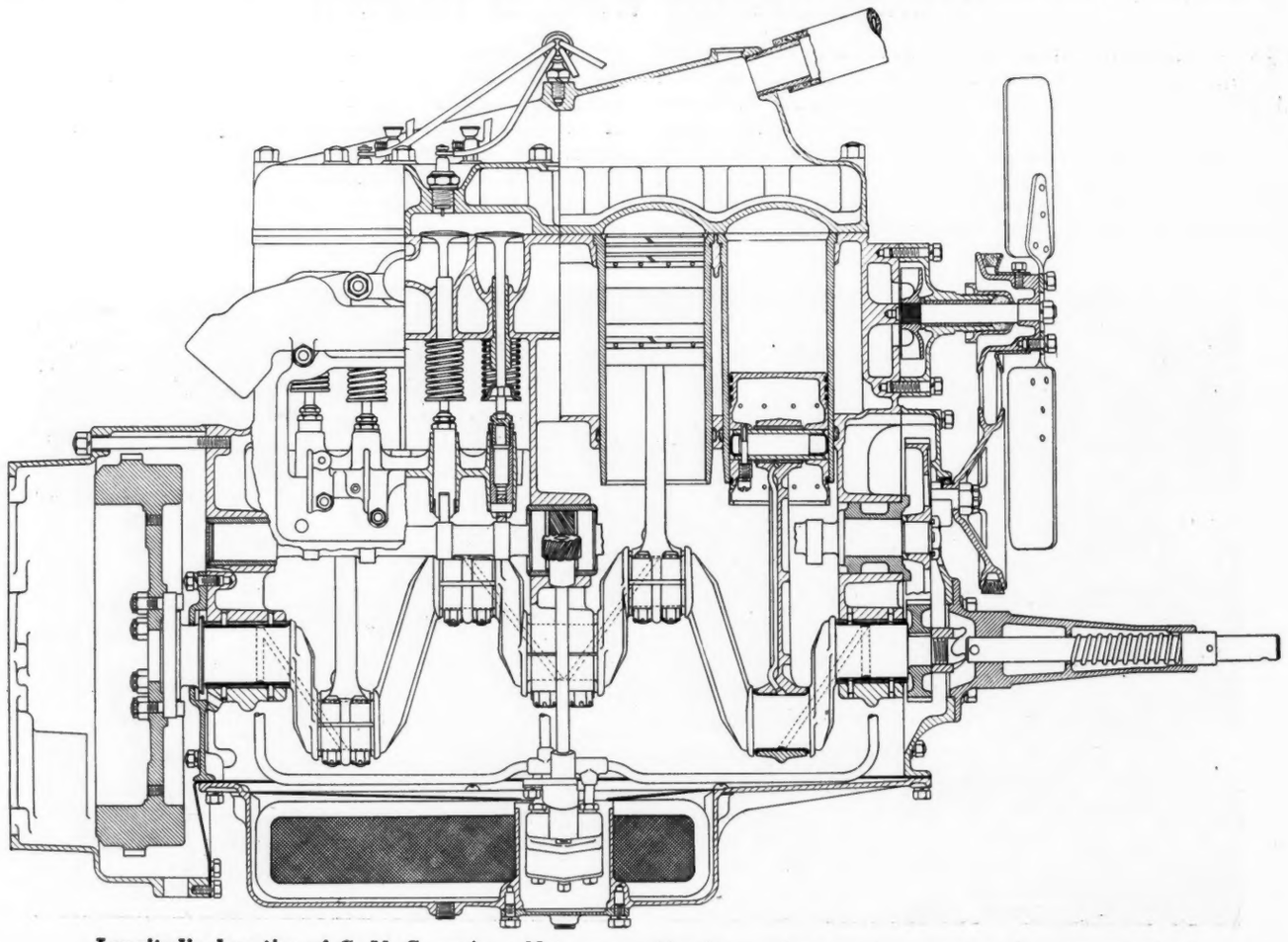
Three larger sizes are equipped with seven-speed transmission, having two sets of constant mesh gears. Will manufacture own engine in three sizes, all of similar design, and all equipped with removable sleeves. New trucks will be faster and more powerful than former models.

By J. Edward Schipper

THE General Motors Truck Co. is just beginning production on a new line of trucks which represents a development of the line previously marketed. The new line is made up of five models. Three engines, all of similar design and all products of the new General Motors truck engine plant located in Detroit, are used in these trucks, the smallest engine being used in both the ¾ and 1-ton, the largest in both the 3½ and 5-ton sizes, and the intermediate size in the 2-ton only.

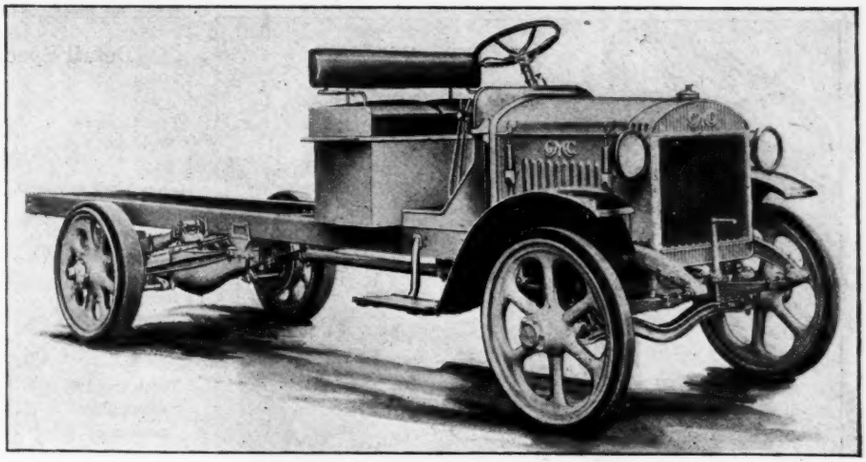
The trucks are designed with an idea of furnishing uninterrupted transportation and incorporate a great many features of interest from the maintenance side. The new engine may be said to have been designed with a view to keeping maintenance cost as low as possible and reducing to a minimum the period of tie-up when repairs become necessary. As compared with the old line of G. M. C. trucks, the new line is faster and more powerful. Heretofore, the design has been laid out with the principal idea of supplying sufficient power for all circumstances. However, with present road and transportation conditions the factor of speed is as important as that of power.

By improvements in the design of the engine, considerably more power, or rather more torque, has been se-



Longitudinal section of G. M. C. engine. Note removable sleeves, large water spaces and arrangement of water pump on fan spindle

cured, although the cubic displacement remains about the same as in the older model engines. The engines run at higher speeds, and this, in connection with a specially designed gearbox, with an additional countershaft reduction, provides twice the number of available gear ratios and, consequently, widens the range of performance and gives a flexibility to the vehicle not approached in the old models.

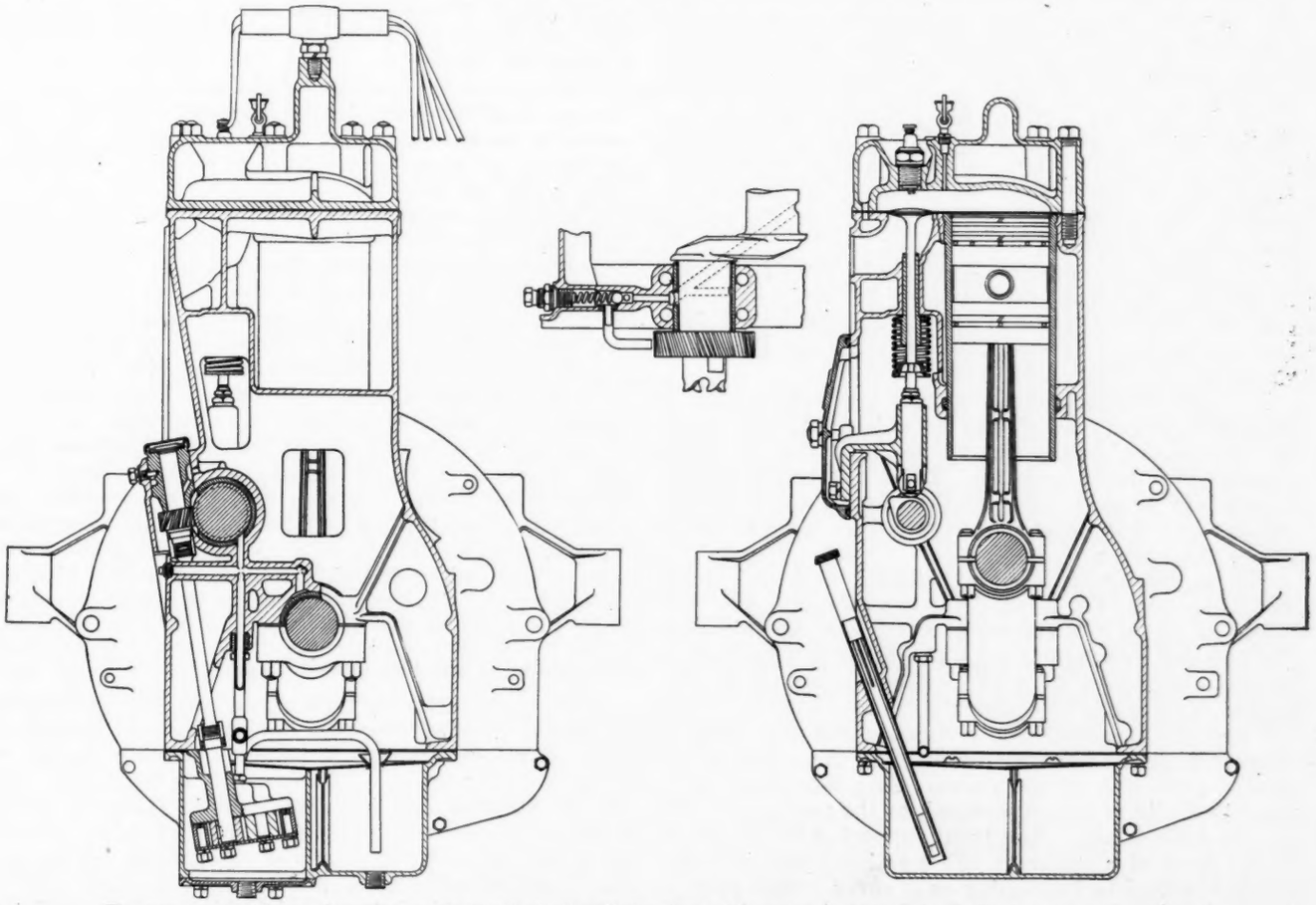


Two-ton model K truck chassis of G. M. C. line

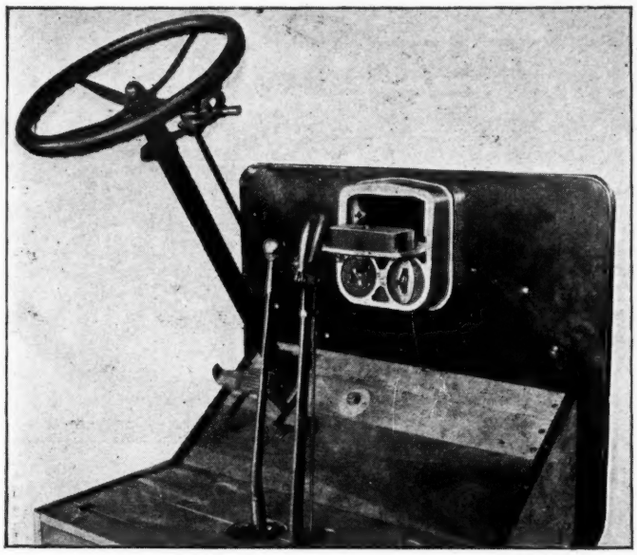
The new G. M. C. engine incorporates some features more or less novel in truck engine design. These include removable cylinder sleeves, force feed lubrication, superheated high velocity intake manifold, interchangeability of all wearing parts, removable cylinder heads, removable motor support arms, connecting rod bearings cast integral with the connecting rods, combination thermosiphon and pump cooling system, removable valve assembly and non-scoring piston pins.

Probably the most interesting feature of the engine is the removable cylinder sleeve. These sleeves are gray iron castings, machined to very close limits both inside and out. In manufacture, they are first cut off, then rough-machined all over on the outside and inside. After a period of aging, the bore and the outside are finished. The advantages claimed for this construction are interchangeability, ease of replacement and elimination of misalignment of the cylinders because of shifting of cores in casting. Should a cylinder wall be scored through lack of lubrication or any other cause so as to necessitate replacement, it is possible to make a replacement in 4 hours—a great saving in time as compared with the 10 days to 2 weeks usually required for regrinding. Not only does this result in a saving in service cost, but also in a reduction in the lay-up time of the truck.

The cylinder liner being of uniform wall thickness, expansion of the liner will be uniform, thus obviating compression leaks due to irregular expansion. The sleeve comes in direct contact with the water, and the



Transverse sections of engine, and detail of oil relief valve. Oil pump is driven by helical gears at center of camshaft. Full pressure oil system is used. Pistons and all parts of valve actuating mechanism are lubricated by splash



Switches and instruments are assembled on an aluminum casing with hinged panel which can be lowered to give access to terminal connections

Detail Specifications of G. M. C. Series K Trucks

	K-15	K-16	K-41	K-71	K-101
Tons Capacity.....	¾	1	2	3½	5
Wheelbase, inches....	132	132	146 158	163 187	163 187
Tires, kind.....	Pnu.	Pnu.	Sol.	Sol.	Sol.
Tire size, front.....	33x4½	34x5	36x4	36x5	36x6
Tire size, rear.....	33x4½	34x5	36x7	40x5 Du.	40x6 Du.
Type of wheels.....	Steel Felloe Wood Spoke	Steel Felloe Wood Spoke	Metal	Metal	Metal
Bore and Stroke.....	3½x5½	3½x5½	4x5½	4½x6	4½x6
Type Radiator Case..	P-stl.	P-stl.	Cst.	Cst.	Cst.
Type Elec. System...	None	Starting & Lighting	Lighting	Lighting	Lighting
Truck speed m. p. h..	.....	25	18	17	15
Gearset placed.....	On Eng.	On Eng.	On Eng.	Amid	Amid
Transmission speeds .	3 forward 1 reverse	3	7	7	7
Final Drive Type....	Bevel	Bevel	Worm	Worm	Worm
Rear Axle Make.....	Own	Own	Timken	Timken	Timken
Total Gear Reduction	6.00	6.00	7.25 and 7.79	8.75 and 7.17	10.0 and 6.28
Brakes, foot.....	Ext. r-w	Ext. r-w	Int. r-w	Int. r-w	Int. r-w
Brakes, hand.....	Int. r-w	Int. r-w	Int. r-w	Int. r-w	Int. r-w

water capacity of the jacket has been greatly increased. The sleeves are longer than the total length and throw of the piston, and the exterior of the sleeve is machined to extremely close limits to afford a good seat for the gasket. The top gasket is of asbestos, and is placed immediately under the flange of the sleeve, while the lower gasket is of compressed cork and is placed in a recess in the cylinder casting. The cork gasket is compressed when the sleeve is inserted, the lower end of the sleeve being slightly tapered. Since the sleeve is a press fit, a perfectly water tight joint between sleeve and cylinder block is obtained. After the sleeve is inserted and sealed, it is held in place rigidly by the cylinder head, which is bolted down with twenty-four ⅝-in. studs. When the sleeves require replacement they are withdrawn from the cylinder casting by the use of a special tool which resembles a wheel puller.

The separate cylinder head casting is of semi-steel and is readily removable for access to the combustion chamber, valves and piston heads. The heads are made large so as to provide a large body of water over the valves and combustion chamber.

The cylinder block and crankcase are cast in units of semi-steel, and no wearing parts which are not replaceable are secured to any part of the block with the single exception of the valve seats. These are provided with a sufficient amount of metal to allow of reseating the valves many times more than required during the normal life of the engine.

The engine has three-point support, ball and socket mountings being employed at the two rear supports. The frame on which it is carried is of the semi-flexible type. The ball and socket joint is held together by a bolt which passes through the joint and extends below the engine hanger far enough to enable the insertion of the heavy coil spring. In addition to giving a three-point flexible suspension, the supports will yield in the event of excessive distortion of the frame. Any wear that takes place in the joint is compensated, as the spring provides an automatic takeup. The front support of the engine is in the form of a collar on the starting crank housing, which is bolted to the timing gear cover. This suspension point is also protected by the spring and clamp method to allow for disalignment.

There are four piston rings, three above the piston pin and one in the skirt below the pin. Grooves are cut in the piston face immediately below each of the two lower rings. Holes are drilled from the bottom of these grooves to the interior of the piston, providing a return passage for surplus oil. The rings are of the plain, diagonally split type, except the second ring from the bottom, which is an expansion ring with an overlapping joint and is so designed that the pressure between the two pieces keeps the ring tight in the groove and also against the wall.

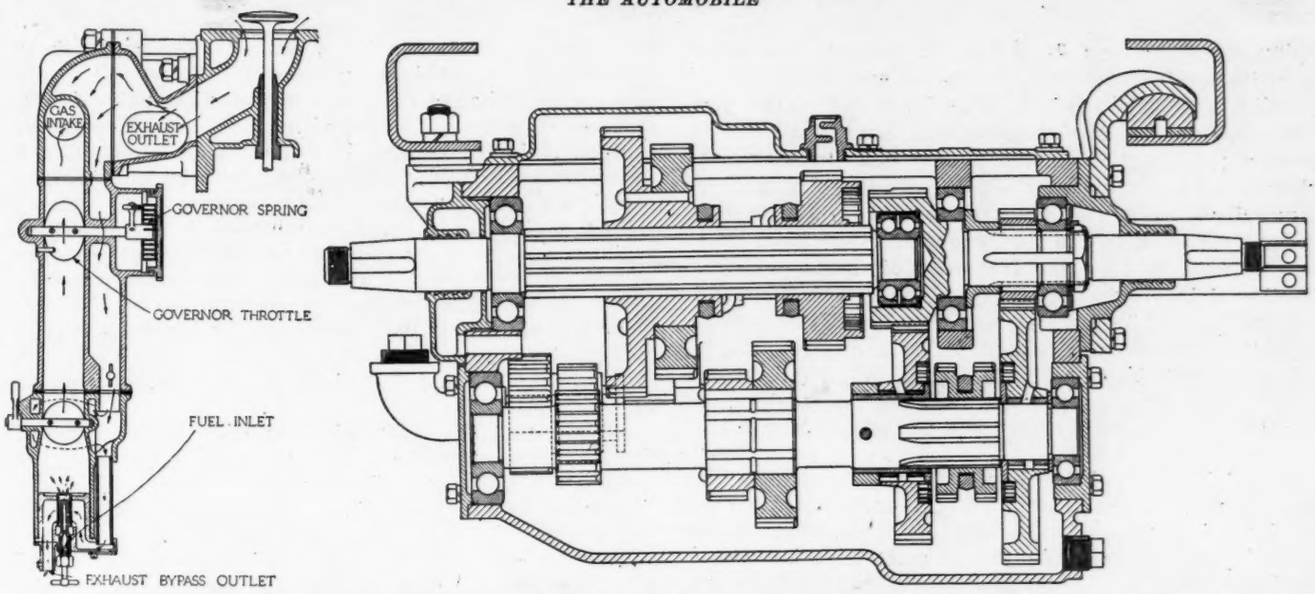
The non-scoring feature of the piston pin is due to bronze plugs inserted in the ends of each pin. This metal is exceptionally soft bronze, so that in the event of the pin working its way into contact with the cylinder wall it will not score it.

The connecting rods are drop forgings of high carbon steel, the upper end being bored and reamed and provided with a bronze bushing forming the bearing on the piston pin. The lower end of the rod and the cap are electro-plated with copper after being machined. They are then tin plated, after which the bearing metal is cast into the head. This method of construction is used because of the impossibility of securing a good contact between the bearing metal and the steel rods by other means. As a service feature, this method of babbitting the rod has been found advantageous in passenger car practice and should work out well for trucks also. Instead of rebabbitting a rod, the entire rod is replaced and the used rod returned to the factory. Rods can be readily changed by dropping the pan. For long distance transportation, it would be feasible to carry a replacement rod along in the tool box.

Provision for Starters on All Models

The crankshaft is a high carbon steel drop forging, supported by three bearings held by webs in the crankcase. The center bearing is provided with flanges to take the end thrust. The flywheel is semi-steel, machined all over and balanced, and is fastened to the flange of the crankshaft by six alloy steel bolts. Starter teeth are cut on the flywheels of all engines, and electric starting can be provided on all models.

The camshaft is drop forged of high carbon steel, the cams being forged integral with the shaft. Both the bearings and cams are hardened and ground to size. The



At left, sectional view of exhaust heated inlet manifold and carbureter. At right, longitudinal section of transmission which has two speed ranges, giving 7 forward and 2 reverse speeds. This is made possible by use of two constant mesh gears with positive clutch between them

camshaft is driven by helical gears and the oil pump is driven off the center of the camshaft by a helical gear and vertical shaft. The engine is oiled by a full force feed system. The oil pump, which is located in the bottom half of the crankcase, forces the oil to the three main bearings and to the three camshaft bearings. From the camshaft bearings it is returned to the crankcase. From the three main bearings it passes through conduits drilled in the webs of the crankshaft to the four connecting rod bearings. From the four connecting rod bearings it is forced through copper conduits secured in the side of the connecting rods to the piston pin bearings, from which it returns to the sediment chamber.

Lubrication Details

Pressure is regulated by a ball and spring by-pass valve. The capacity of the pump is such that there is a surplus of oil at all times. This surplus passes through the by-pass valve and is discharged directly on the timing gears. The oil which is forced out of the ends of the main bearings and connecting rod bearings is thrown out as spray and lubricates the cylinder walls and valve lifter assemblies. The oil pump is hung in the crankcase on a bracket to which it is securely fastened. It is of the gear type and is driven from the camshaft through a splined vertical shaft. The oil pan, which is an aluminum casting, incorporates sediment chambers through which the oil must pass before it returns to the pump intake. The first settling chamber is under and around the pump, although it is separate from the intake. The major portion of the dirt or sediment contained in the oil is deposited in this chamber before the oil passes to the last settling chamber, and it is possible to readily drain this by the removal of a plug beneath the pump. The first settling chamber has a capacity of about 1 pt., which is all the oil that is lost in cleaning the oil pan.

The water in the cylinder head and around the valves is circulated by the pump. The water contained in the jackets around the cylinder sleeve is not affected by the pump, but circulates by gravity. Thus the water around the jackets does not begin to circulate until it is heated sufficiently to set up a thermo-siphon action. The water pump is of the centrifugal type, its impeller being mounted on the inner end of the fan shaft and rotating in a recess cast in the cylinder block. The shaft rotates on a Hyatt roller bearing, and is lubricated by an Alemite connection.

On the two lighter models, known as K-15 and K-16, the radiators are of the vertical fin and tube type, the tubes being assembled in connection with the cooling fins in a single unit or core. On the three larger types, K-41, K-71 and K-101, the radiators are of the vertical continuous fin and tube, built-up type, the assembly consisting of a core which is detachable as a unit, two side members, so designed as to protect the core, the top and bottom members in the form of tanks, which insure even distribution of the water throughout the entire core.

A combination manifold and carbureter have been worked out to take care of present day gasoline. Both the vertical section of the intake manifold and the venturi chamber of the carbureter are heated by exhaust gases direct from the exhaust manifold. Dampers are provided for regulating the supply of heat, and for very hot climates a gasket can be inserted which cuts out the exhaust jacketing altogether, eliminating the hot-spot and permitting operation at atmospheric temperature. A Marvel carbureter is used.

The governor is of G. M. C. design and is of the fly-ball type. It consists of four steel balls held in a steel pressing containing four separate grooves which act both as ball retainers and channels in which the balls travel. As the channels are set at approximately 45 deg. angle to the shaft of the governor, the balls travel both outward and forward under action of the centrifugal force. The balls contact with a flat steel disc, which is mounted on a bronze bushing, and as the balls are thrown outward and forward, the disc is pressed forward. This disc contacts with a ball thrust bearing, and through this bearing connects with the governor butterfly control lever on the carbureter. Lubrication of the governor is effected by the oil which is discharged on the timing gears, so that it is at all times working in an oil bath.

The Electrical System

Ignition is by an Eisemann magneto which is mounted on the generator side of the engine and is driven through a coupling from the armature shaft of the generator. On all but the smallest model the Eisemann impulse coupling is fitted. The electric generator is of G. M. C.

design, manufactured by Remy. It has been designed exclusively for truck use, being rugged to withstand pounding and hard service. The front end of the generator is cylindrical in shape and is machined to fit an opening in a portion of the timing gear housing cast integral with the cylinder block. The driving gear is mounted on the end of the armature shaft and meshes directly with one of the timing gears. This same shaft then projects through the front end of the timing gear housing and carries the pulley which drives the pump and the fan. The generator is fitted with thermostat control and third brush regulation. The thermostat control automatically varies the amount of current delivered to the battery by the generator, increasing the charging rate in cold weather and decreasing it in warm weather.

The wiring is made up in unit form. Except on the smallest models, the instruments are assembled on an aluminum instrument board with a panel which can be lowered to give access to the switch connections and terminals. No electric lights are furnished on K-15, the smallest model. The other four, however, are provided with two electric headlights and one tail light.

No material changes have been made in the clutch, which is a multiple dry disk type, with eleven disks in the two smaller models; thirteen in the 2-ton and seventeen in 3½ and 5-ton. It will be seen by reference to the accompanying cut that the transmission is of unusual design in that it incorporates two speed ranges. This is made possible by providing two pairs of constant mesh gears. The driven gears of each pair are loose on the secondary shaft but either of these can be connected to this shaft by engaging with them a positive clutch located between the two and splined to the secondary shaft. Integral with the latter are three gears arranged in conventional fashion for meshing with the sliding gears on the main shaft. It will be seen that three forward reductions are possible in combination with each of the pairs of constant mesh gears. Consequently there are, with the direct drive included, seven forward speeds obtainable. Change from one to the other pair of constant mesh gears is controlled by a separate lever. Except for this the control is conventional. The double speed range is said to have been incorporated by the addition of only four parts to the gearbox.

This double range transmission permits of the use of a higher geared rear axle, thus promoting economy, and at the same time enables a greater maximum tractive effort. It is estimated that, as compared with the previous models, the pulling power of the trucks has been increased 30 per cent, and the economy the same. A third lever is fitted for changing the constant mesh gears.

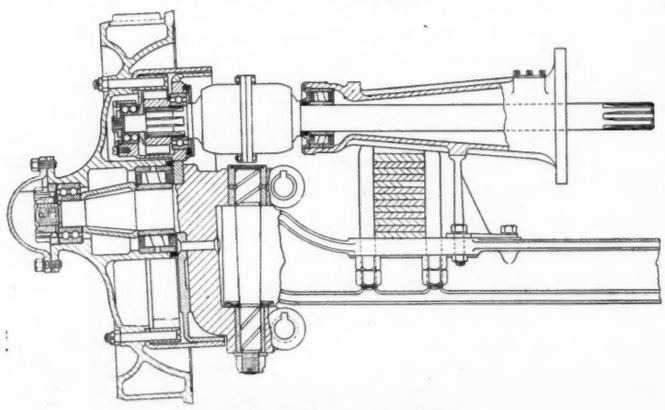
All of the G. M. C. transmissions, with the exception of that on the small model, are so designed as to enable the installation and use of both power take-off and power tire pump at the same time. The K-15, which is the smallest model, has a tire pump mounting only.

The rear axles are bevel gear-driven on the K-15 and K-16, the two smallest models, and worm-driven on the others. These rear axles have not been changed from previous G. M. C. construction, except as regards the gear ratios. The axles on the heavier models are of the Timken worm gear type. The two smaller types are equipped with steel felloe wood wheels, and the larger models are equipped with metal wheels of the hollow spoke and felloe type with the hubs cast integral. Pressed steel brake drums bolted to the inside of the wheels are used on all models. The frames are open hearth pressed steel of channel section and are all heat treated to increase the tensile strength and elastic limit of the metal. The steering gears are all of G. M. C. design and manufacture and are of the worm and split nut type. They are irreversible and adjustable, the gear being anchored in a bracket riveted to the frame and rigidly held by a heavy plate and column where it passes through the floor boards.

A Front Wheel Drive

THE most interesting feature of any four-wheel driven vehicle is the arrangement of the front drive, because the driving connection to the swiveling front wheels is the hardest problem to solve. In fact, it is in the driving connection to the front wheels that the various front-wheel drive trucks differ most.

The drive to the front wheels used on the Bollstrom truck, which has been on the market for a number of years, is shown in the accompanying cut. This is of the internal gear type, the same as used at the rear end. The axle end is of the inverted Elliot type. To the outside of the vertical part of the knuckle is secured a flanged disc similar in shape to a brake drum. This serves as support for the driving pinion bearings. The wide flange on the disc evidently makes it very rigid and gives a substantial support to the bearings. The pinion shaft is supported in ball bearings on both sides, the outer bearing (which is necessarily of limited diameter) being of the double row type.



Bollstrom front wheel drive

In order to protect the gear from mud and dust the internal gear on the cast-steel wheel is surrounded by a pressed steel drum which hugs closely the flange of the bearing supporting disc, extending across its entire width. No section of the universal joints is shown, but to judge from the length of the cover, it is a double universal, which takes care of slight mis-alignment of the center portion of the counter shaft and its ends. Felt packings are provided where the countershaft enters the gear housing in the wheel and at the inner end of the wheel hub.

THE study of the manufacture of oxygen from the point of view of the engineer is being undertaken at the Harvard Engineering School under the direction of Professor Harvey N. Davis. This study is made possible by a gift to Harvard of $5,000 from the Research Corporation, founded through the efforts of Dr. F. G. Cottrell.

Why American, British and Continental Car Designs Differ

British engineer discusses the effect of customs, climate, road conditions, taxes, operating costs, size of industry, point of view and competition upon the size, cost, appearance and design of passenger cars. Motoring here is characterized as transportation, while in Europe the spirit of adventure still dominates. Considers American braking systems defective.

By M. Olley*

THIS paper is presented rather as a record of impressions than an accumulation of facts and figures. My observations will be confined to passenger cars, with which alone I am familiar.

We will first look at the difference between the conditions in the automobile industry in Europe and America, and then consider the reasons for the difference.

The American industry is turning out large quantities of cars on a purely commercial basis. Its mind is concentrated on the ultimate consumer, and it appears to believe that the consumer rules it completely, just as the manufacturer of vacuum cleaners or sewing machines is at the mercy of the housewife.

The French and English makers are not in this position to the same extent. They do not manufacture cars in such large quantities, but to a greater extent than here each one of them supplies a strictly limited field with a specialized product of some individuality. Their profits of past years have not been entirely re-invested in enormous increases of plant and equipment and therefore, though they break and fall and rise again in new form, they are at no time quite so securely tied to the "market" as the American manufacturers.

The only qualities that their products need have, in order to sell, are that they shall transport passengers on the roads with some degree of reliability and considerable speed. Beyond this requirement there is absolute freedom.

Here, on the other hand, every manufacturer of vehicles other than motorcycles, must make something which has all the qualities of the traditional automobile —it must have an engine of at least four cylinders, almost necessarily water-cooled, with the traditional arrangement of fixings under the hood, a traditional clutch and three-speed gearbox (with the one exception) and the traditional propeller shaft to the traditional differential and live axle. Of course, it must have four wheels and a top or covered body, and the wheels even must be 56 in. apart—no more or no less. A truly crippling state of affairs.

The reasons for the differences of the industry and design of cars here and in Europe appear to me to be somewhat as follows:

First—Motoring here is transportation, pure and simple. It is rapidly coming to be the most important system of transportation in the country.

In Europe, leaving aside the recent vast increases in trucking in England, the automobile is not transportation, it is adventure. A man mounts his three horsepower motorcycle in England with the feeling of a knight-errant. Here he jumps into his four-door sedan as one boards a street car. This one fact is of the utmost importance in automobile design. One explanation of it might be that there are about ten or fifteen times as many cars here per unit of population, but I think this may be an effect rather than a cause, the car being so essential for transportation here that a vast number were produced, while the car was so unessential in Europe that it remained a rarity.

Probably the great reason for motoring being a commonplace here is the higher standard of living which brings a car within the reach of almost everyone, whereas in Europe it is still almost a luxury.

Again, in Europe the better roads, the more attractive and historical countryside (with apologies to New England), the more merciful climate, do certainly enhance the pleasure of motoring. At the same time the commuting difficulties that curse the wage-earner in this country, for some reason do not exist in Europe.

All these causes contribute toward rendering the car in Europe a vehicle of considerable romance, not merely a daily drudge, or a common household appliance.

Second—A very important factor in the automobile world in Europe is the cost of owning a car. The first cost as compared with the States is difficult to determine because of the reduced value of money, and the difficulty of assessing the true value of cars. It is best probably to take pre-war money equivalents since the value of money has decreased about equally in Europe and here, during the war.

It appears approximately true to say that a car will cost twice as much in England as in the States in proportion to living standards, and in France almost twice as much as in England.

Gasoline in England is about 80c. an imperial gallon, say 65c. a United States gallon, and in France 12 francs to 15 francs for 5 litres, or say $2.00 to $2.50 a United States gallon.

Tires appear to have fallen in price in England even more than here. In pre-war days tires there were about twice as expensive as here. Furthermore, whereas American makers understate the actual size of their tires, the European tires were far below their stated size. Perhaps as a consequence of this, the European tires will not generally give anything like as good mile-

*Paper read before the Boston Section of the Society of Automotive Engineers at Springfield, Mass., Feb. 25, 1921. The author is chief engineer of the Rolls Royce Co. of America, Ltd.

age as American tires of equivalent rating. As an example, the 895 x 150 European tire (which should be about 36 x 6) is actually the close equivalent of the American 33 x 5 both as regards size and wearing qualities.

Finally, taxation of cars is cruel in Europe, particularly England, where the tax is now one pound (nominal $5) per horsepower each year, horsepower being the rating on the cylinder diameter as in America.

Third—Another important factor, at least in England, is the fierce competition of the motorcycle continually developing upward to try and get the small car trade.

This condition affects the industry as well as the design. The motorcycle is favored by the higher cost of gasoline, tires and taxation, later average age of marriage, the habit of renting houses rather than buying them, with consequent shortage of garage space, and better roads and weather conditions. I imagine that in England there are at least two motorcycles to one car. There are seven firms making motorcycles in the States against 50 in England.

Fourth—The automobile industry in Europe is limited by the lower standards of living, by lower wages, also probably by a higher standard of thrift. The limitation of the industry has reacted upon itself in enhancing the cost of cars. It remains to be seen whether Ford and the other American invaders can break down this obstacle to development.

Another limiting factor is the distinct prejudice in the minds of many Englishmen against motorcars because they are an offense against the doctrine of "regular exercise." Many well-to-do city men in London suburbs do not own cars to this day because the weekend is devoted to exercise of one sort or another, cycling, walking, tennis or cricket, and a car might break down these regular habits.

Fifth—Design of cars in Europe is, of course, affected directly by climatic conditions, the open car being the popular model all over Western Europe, and the top, or cape-cart hood, as it is still called, being an accessory, for use only in severe weather.

Sixth—Road differences affect design differently in England and France, the national highroads of the latter country (and perhaps the racial peculiarities of the inhabitants) making speed the one essential.

Seventh—Design in England is affected greatly by the essential democracy of its inhabitants or perhaps by the fact that there the car is not the standard of the man.

Here a man will buy a car of cost proportioned accurately to his income or his pretensions.

There a cabinet minister or railroad president will own a Ford sedan, or will take pride in the possession of a miniature vehicle peculiar to the country, called a "light car" or voiturette, and resembling a traveling bath-tub. His social status is not governed by the car he drives, or by his income, but rather by the particular accent with which he speaks the English language.

Summarizing the conditions then, they are:

1—The spirit of adventure.
2—The cost.
3—The motorcycle.
4—The limited size of the industry.
5—The climate.
6—Roads.
7—The lack of definite money standards.

Surveying these governing conditions casually, one can trace the effects with fair correctness:

Condition 1—The spirit of adventure. The European motorist demands less convenience than the American. As an example, whereas the American demands electric starting and lighting, even on a Ford or motorcycle, many European small cars are content with electric light only, retaining hand starting; and many small cars, and nearly all motorcycles retain the old-fashioned gas lamp.

Generally, the American user demands that the car shall give useful service with the minimum of skill in handling, whereas the English, and still more the French, owner delights in a car which will give maximum results in the hands of a skilled driver.

Condition 2—Cost. This affects the Continent and England differently. On the Continent, though many excellent small cars are being produced, the best efforts of the trade seem to be mainly directed to the larger cars, and the automobile trade appears to have made up its mind to cater to the rich principally. In England on the contrary the middle class is having its demands met by the cars which I have called rather rudely "traveling bath-tubs."

These little cars have been continually produced in England since the earliest days but have always either perished because their cost was out of proportion to their performance or else have gradually developed into larger and more pretentious vehicles from year to year. But now the small car appears to have come in with a rush in England and it looks as though it would be the quantity production car of the future in that country, and perhaps in other countries.

These miniature vehicles, complete in every essential, are most excellent machines from every point of view for use where roads are good.

Condition 3—The motorcycle is becoming an institution in England and is used by old and young, and by both sexes almost equally.

On English roads and in English weather, it is the perfection of motoring as distinct from mere luxurious riding. The machine amounts to nothing in itself, weighs only 150 lb., is no bigger than an ordinary bicycle, travels 100 miles on a gallon of gas, yet transports you anywhere at 30 miles an hour average and 60 miles an hour maximum speed.

It can never lose its place in the affection of the British motorists, probably 80 per cent of whom have served their apprenticeship on motorcycles. It is a fine training for driving a car.

There is no hard and fast line of demarcation between motorcycles and cars in England, except in the matter of number of wheels. All vehicles of four wheels, however arranged, are classed as cars and taxed at the rate of one pound per horsepower, while vehicles having two or three wheels are all motorcycles in the official eye and are taxed independent of horsepower at a flat rate of £4 per annum with three wheels, and £3 per annum with two wheels. Hence there is a development away from the traditional motorcycle and sidecar combination to a machine which is in all respects a small car except that it drives to a single rear wheel instead of the customary two-wheeled rear axle.

These vehicles are nowadays of very excellent mechanical construction, and are entirely safe, because they are hung low. They are fast and efficient, making 50 miles or more to the gallon and up to 45 miles an hour. They cost up to £300.

The gradual development of the three-wheeler would have been a severe blow to the car makers had they not come down to meet it with small cars of even greater excellence mechanically, which can carry two or four persons in comfort at high speed, with a rated horsepower not exceeding 12 (R.A.C. rating).

These two movements, upward of the motorcycle and downward of the car, have determined the typical British car-type of the present day, coupled of course with the terrific burden of taxation and the high cost of fuel.

Condition 4—The limited size of the industry, and of the individual manufacturers, makes for higher cost, but for a more painstaking treatment both of the initial design and of the finished article. It makes for a car of more individuality, for a greater distinctiveness in each maker's designs, and for a greater receptiveness to designs which are highly unconventional.

It is well known that where output is restricted, the product is likely to have, and may safely have, more individuality than where output is great.

In other words, the design of the average European car is largely controlled by the Engineering Department, whereas the design of the American automobile is principally controlled by the buying public through the sales organization. In the main, this seems the explanation of the great similarity of American cars as compared with European.

Minor points of individuality are emphasized in the American advertising, which would pass unnoticed in the advertisements of a European car, in which the public would assume that there were many points of design differing radically from other cars.

Condition 5—The climate is chiefly felt in body design. There is a positive prejudice against permanently covered cars, except in the most luxurious types. The top is still only an emergency affair of waterproof canvas, and is only put up for severe rain storms.

Wings and skirting panels are less complete than in America, and the protection against mud and wet is not nearly so advanced. Generally, the weatherproofness of European cars is less perfect than American cars.

In the mechanism of the car the chief effect is that control of the water temperature has not attracted so much attention as in the States, and less care is taken on the average European car to insure an effortless start in cold weather. When night temperatures very seldom fall below 27 deg. Fahr., one can understand that a car designed purely for use in England and employing fuel far superior to American gasoline, need make little provision for forced vaporization.

The Rolls-Royce practice of fitting a vaporizing primer and regulatable jets is quite exceptional in England and purely due to its cosmopolitan use.

Condition 6—Roads. In England the road surfaces are excellent—even now, after years of neglect, the roads are still excellent whatever the English themselves may say. The moist, temperate climate keeps a water-bound macadam road in perfect condition almost forever without repair, so long as the traffic is not too heavy.

But the grades are heavy, the roads have just grown rather than been planned, and hence there are few straight stretches and few easy hills and most of the roads are narrow. The old coaching turnpikes, and occasional vestiges of the old Roman "streets" are the only exceptions. Because of the hedgerows, blind corners and hidden crossroads are the rule rather than the exception.

As a result, "handiness" is essential, cars must run well on top gear at all reasonable speeds and on all ordinary grades, and brakes must be above suspicion, ready for instant call.

In France there are three sorts of roads, the national highways, which are perfect motoring roads in every sense of the term, the secondary roads which are the opposite, and the cobbles in the towns and villages which are atrocious. The result is seen in French car design.

Speed for the national highways is the first consideration. Roaring, noisy motors which will make 4000 revolutions without flinching for hours on end; carbureters, which may or may not give flexibility, must be of the "straight-through" type, offering no obstruction to the inlet gas, and brakes, often on all four wheels, which will pull up a speeding car in a minimum distance, are demanded.

For the by-roads and city streets, with unflexible carbureters, there must be four speeds, a powerful clutch brake, an easy change lever, and plenty of slack in the transmission gears, so that the lever can be crashed over, up or down, at all speeds, without care or effort. There must be stiff springs and a sturdy framework both for high speed and for city cobblestones.

The average Continental car on English byways is uncomfortable to drive, uncomfortable to ride in, rough and noisy. But on Continental roads, it is in its element and shows to advantage, if one is a courageous speed-hound.

American road conditions, now happily passing, have called for a car which can "go anywhere in high." Hence the low axle ratios, large engines, small high-velocity induction systems, and other features which cause the typical American car to "waste its sweetness on the desert air" at all speeds above 25 miles an hour.

The American car is the most convenient vehicle in the world to start, and to drive; it is the best able to get any place whether there is a road there or not; it is the paradise of the lazy driver. It is all-the-year-round transportation with the minimum of grief. But it is not a speed monster; it is not pleasant to steer (with certain exceptions) and its brakes are deplorable.

Condition 7—Price standards. In America one is proud. If one has a car it must be a real car, or at least look like one. It must be of such a size that the human figure does not noticeably overlap the edges. Makers of the smaller cars, in the illustrations of their advertising matter, fill their cars with pigmies to enhance the impression of reality. To agree with the illustrations of my own car, I should be not more than four foot six inches tall.

The American buying public is assumed to have formed its standards. It expects, or the manufacturers assume that it expects, just the same main features in a $1,000 car as in an $8,000 car.

In France, and the Continent generally, the fully fledged car is generally for the rich, and as such is complete and rather conventional. It is also distinctly expensive.

There have always been "voiturettes" in France, of one cylinder or more, but they have never been regarded very seriously and actually do not call for a full driver's license for permission to operate.

In England there are no accepted standards of design. The two standards of practice are only speed and economy. Until recently there were numbers of single cylinder cars. Now these have ceased, but an engine may have two, three, four, five, six or eight cylinders; it may be air or water-cooled; horizontal, vertical, Vee or radial.

The transmission may be of two, three, or four speeds, or, in a number of small cars, by friction discs and gears, or chains to the back axle. Chain, propeller shaft or Vee belt may be used. Hotchkiss drive or torque tube, differential gear or none, back axle or single wheel—all are acceptable to the buying public.

The actual size and shape of the cars vary enormously. The three-wheelers generally have the single wheel behind, but at least one has two wheels on one side

and one on the other. The track width of four-wheelers varies from 42 in. to 58, and the wheelbase from 80 in. to 150 in.

The tire sizes on cars vary from 27 x 2½ to 35 x 5, and wheels may be wood, steel-spoked, wire or disc. Wire wheels are in the majority.

Starting may be electrical or unassisted. Lighting, by electricity or gas; ignition, however, is at present almost universally by magneto, but the battery is slowly gaining ground.

External appearance is uncontrolled and varies from the extremely dignified to the extremely weird, and from the utmost symmetry to an indescribable lopsidedness. Among the miniature cars some most beautiful proportions are to be found, while many bodies fitted on large cars would attract jeering crowds in the States. The reverse is equally true.

As regards color, England and Europe generally demands the full run of the spectroscope. To European eyes all American cars are black. Bear in mind that anyone may ride in the most peculiar or tiniest of these cars without loss of dignity, and you will see how free and untrammelled is the scope of automobile design in England.

Perhaps what I have already said will serve to show the conditions which American cars have to meet in Europe. American cars have sold and are still selling in Europe in large numbers because they have a great reputation for reliability, and they can always be bought from stock, but they do not show to such a great advantage in Europe as in America.

The reason for this is that their engines are too big for the performance obtained from the car. (I am speaking, of course, from the European point of view). In other words, they consume too much gas.

Perhaps the following table of average dimensions will illustrate this:

Average Particulars of Cars

	American	English	Continental
Cylinders	6 (58%)	4 (69%)	4 (80%)
Horsepower (N. A. C. C. rating)	26	13.8	15.5
Bore, in.	3.4	2.95	3.1
Stroke, in.	5	4.75	5.1
Stroke Bore Ratio	1.45	1.6	1.65
Wheel track, in.	56 (All standard)	51 (42-58 range)	53 (40-56 range)
Wheelbase, in.	122	115 (88-150 range)	122 (86-146 range)
Axle Ratio	4.5	4.15	...
Number of passengers	6	3	...
Weight of chassis	...	1,800 lbs.	...
Weight of complete car, lb., probably about	3,000	2,300 (Many cars 1,500-1,700 complete)	...
Price	$2,794	£610	...

In France a number of cars are developing on American lines, unit construction, battery ignition, smooth external appearance, detachable cylinder heads, left-hand steering, and a host of detail fittings are making them appear more and more like American cars. Where they differ is in having greater speed, less top gear flexibility, but better brakes.

I cannot find the average price of French cars but imagine that the rate of exchange, import duty, etc., make competition from this side very difficult.

The American car probably is at a disadvantage in its quality of finish and the detail design of its mechanical parts, which have always looked rough and ready to the European eye. Its lower maximum speed would count against it.

Since on the Continent cars are run only by people of some wealth, the tax and fuel consumption of American cars are not insuperable objections.

To judge by pre-war experience, the smaller Continental cars are lacking in completeness, convenience and mechanical perfection. For example, the Continental designer has always appeared to lose patience when he gets to such details as the controls—accelerator connections are liable to consist of the fewest possible pieces of bent wire, and to be unreliable in proportion.

It is in England that the more interesting conditions exist. Here there has always been an admiration of the low-priced American cars, and from the first days manufacturers have been striving to evolve a low-priced car for the English market. The "£100 car" has become almost a slogan.

The failure to produce a really low-priced car has been largely due to the fact that English makers have not realized that a really good inexpensive car can only be made by quantity production, and that it was a matter of capital and tools rather than design.

The attempts at low-price have failed because they have "cut corners" in design, and produced something which either was not safe or was so unlike a real car as to be unacceptable even to the catholic taste of the country.

Now, with enormous taxation on horsepower and expensive gasoline, the conditions have changed and the English manufacturer should be able to meet American competition with a car which is perhaps a little more expensive than the imported cars in first cost, but is ever so much more economical to run, smaller, handier, with better brakes, better external appearance and generally more suitable to the local conditions. And in this respect, it is interesting to consider the following table taken from an English motor paper (**Motor**, Jan. 12):

Cost of Operation of British Cars

	Four Seater 16 hp. to 20 hp.	Four Seater Small Car	Two Seater Light Car	Four Wheel Cycle Car	Three Wheel Cycle Car
Weight (lbs.)	2,800-3,300	1,800	1,600	1,350	Under 800 lbs.
Tax	$75-100	$50-70	$50	$50	$20
Gasoline, gal. per year	300	240	199	132	102
Miles per gal.	20	27	30	45	60
Costs, gasoline.	$220	$160	$145	$90	$74
Tire cost	$150	$90	$75	$60	$50
Oil, mi. per gal.	500	700	1,000	700	700
Costs, oil	$25	$17	$12	$17	$17
Total cost per year	$470	$317	$282	$217	$161
Cost per person carried on assumption of full use of seats	$117	$80	$141	$110	$80

Since the four-seater cars can be assumed to carry not more than two persons on the average, it is safe to double the cost per passenger in the two first cases.

It will be seen that the ordinary American car even of the smallest class would be at least as expensive to run in England as the most expensive type quoted.

It seems to me that England is on the point of solving its transportation problems in an effective manner. It seems also that in view of the fuel consumptions quoted, England is achieving real fuel economy, and it becomes a question whether this country might not attempt to develop on similar lines.

Surely, as a first step to fuel economy, it would be

logical to reduce the horsepower of American cars by 50 or at least 30 per cent, while leaving the axle ratio unchanged or even raising it considerably, and gaining flexibility by reduction in weight and improved carbureter design. Perhaps also by four-speed gearboxes.

It may be objected that it would be necessary to come off top speed more often, but the English light cars only have to use the gears very occasionally in ordinary running conditions, to judge by the reports of trial runs, unless exceptional grades are met, and grades in England are very much worse than here.

Objections to a wheel-track less than the traditional 56 in. are often heard. The first is that the car rocks sideways more with a narrow than with a wider track. I do not think this is so on road surfaces where reasonable speeds can be kept up. The 7-ft. gage railroads in England were proved to roll more than the 56½-in. gage, and narrow gage railroads show good riding qualities. The same argument applies to narrow gage cars on decent roads.

The objection that the narrow cars will not fit the ruts made by other cars on dirt roads or snow, I think cuts both ways. Personally, on a light car I would rather not have both wheels in the ruts at the same time. In the same way street car lines are safer to a car the track of which does not fit them.

As regards road conditions, these are certainly bad in the States as a whole but are rapidly improving, and in the Eastern states are becoming similar to English roads. I believe a light car of European design would perform very well on the ordinary roads of Massachusetts.

With reference to snow conditions, such as we have had in the past week, a narrow track would certainly not be an unmixed blessing, but I have the idea that a small car with a low bottom gear, not too much forward weight, and a really good control of the back axle would push its way through most obstacles, particularly if the road clearance were kept fairly high by sloping the transmission and using small back axle gears. Four speeds would be almost a necessity.

Engine Practice

Many European cars are built around the engine, and in fact in some of them the designer's interest appears to have waned after the engine was completed. This was a real failing of many pre-war cars.

One notices a real attempt to raise the mean effective pressure in European cars, by increased compression, inlet valve opening and induction systems. The valve in head engine is coming in with a certain hesitation, generally with a detachable head.

In at least one case of a detachable head, screwed plugs are still used over the valves. This seems good since with the detachable head, although the operation of cleaning the cylinder is made easier, there is far greater difficulty in making a quick inspection of the cylinder and valves than with the older type of non-detachable head with screwed plugs over the valves. Also, it is more necessary to inspect the interior of the cylinder when a detachable head is used because of the danger of internal water leaks.

With the ordinary type of detachable head, when once the head is detached and replaced, there is a constant fear in one's mind as to what sort of joint has been made, and the only way to find out is to detach the head again, and so on "ad infinitum."

In a large number of detachable head designs, the camshaft is on top, following aero engine practice.

The contrary school is still vastly in the majority, proving by excellent examples that a well designed L-head engine can be as efficient and as free from detonation as the valve in head.

At Olympia, two-thirds of the engines were four-cylinder, and over half the remainder were six. The two cylinder horizontal opposed engine is gaining much favor for light cars, this being a development of motorcycle design.

Air-cooling is only considered for small cars, probably because the danger of freezing is practically not existent in Europe.

Magneto ignition still holds the field in Europe by an enormous majority, but certain makers have been tempted by the very excellent American battery-ignition systems, to abandon their old loves, probably as a matter of justified economy. On small cars without self-starter, the magneto is almost universal and seems correct, since in this way the car can always get home, battery or no battery. So long as an engine is free enough to be started by hand on the magneto, there is a real advantage in having one, at least as a second string.

The battery ignition wires and apparatus extend over half of the car and a number of things are liable to happen to the wires and terminals in inaccessible places, which may take endless trouble to put right. In magneto ignition the only wires are the high tension leads to the plugs, failures of which affect one plug at a time and are easily traced, and one ground wire (which is sometimes omitted on European cars). This wire, if it breaks, will not stop the engine but will prevent its being stopped. If it is grounded it is only necessary to pull it off. Hence the European faith in the magneto, which will take a lot of shaking.

Clutches are about evenly divided between cone and plate in Europe, whereas in America the plate clutch is in a large majority. Perhaps this is accounted for by the excellent cone facing fabrics which one can obtain in Europe, and in America by the cheapness of manufacturing a plate clutch from pressings. In America it is necessary to have a clutch which will slip longer without burning, because of snow, and a multiple plate clutch is good in this respect of course, but not better than a cone clutch with heat proof facing, which is more liable to keep cool than a pack of disks.

Gear boxes have four speeds on 80 per cent of Continental cars and 50 per cent of English cars, even on a large number of the small cars. The advantage of four speeds, particularly on small cars, is evident and might be considered, one would think, for America, if the public could be educated to it. For small powers, the extra weight of a four-speed box is not great, and the speeds are needed. With a decent clutch and carbureter, the car should start on second and climb most hills on top or third, but first speed is good for emergencies.

Gear boxes are being combined more and more with the engine on European cars, particularly the small cars. But in England the majority of gear boxes taken over all cars are still independent and fixed to the chassis behind the engine, 70 per cent being fixed in this way. On the Continent about 50 per cent are fixed to the chassis and 50 per cent to the engine, and the latter method is on the increase.

Some of the English light cars using two-cylinder engines of the horizontal opposed type, combine the clutch casing and gear box with the crankchamber in a very neat form, in such a way that the whole of the working mechanism of the car is accessible by merely raising the bonnet.

Spiral bevels are coming in in a flood, and are not only ousting the straight bevel, but also the worm, which before the war seemed to be gaining favor rapidly. The

spiral bevel is undoubtedly one of the biggest contributions to automobile design since the Bilgram bevel planer.

Springs are almost always half elliptic on the front axle. At the rear there has been a landslide for the quarter elliptic and cantilever, which were fitted on 70 per cent of the cars shown at Olympia.

The half elliptic springs, so popular here, are fitted on less than one-sixth of the European cars, if one may judge by the recent shows.

Since the cantilever spring implies some sort of effective control of the back axle, the movement in this direction seems to be good. The torque tube or other axle control scheme seems too short in many European cars to be really good. In most of them it would have been possible to lengthen it considerably, with advantages in riding qualities and in holding the road.

Some of the European cars retain the fork joint at the head of the torque tube without provision for side movement of the axle, but most makers seem to realize that this is wrong and use a sphere or other universal device.

In general, it may be said that one or two torque tube designs which have recently appeared in the States are far better than the general run of the new European designs, both as regards mechanics and appearance.

Differentials—Several of the lighter English cars omit the differential altogether, and either drive on one wheel or drive both wheels through a rigid axle shaft. This practice does not appear to ruin the tires on a car of 2000 lb. or less, and is worthy of consideration in the States because of its great advantage in mud or snow. America has better tires at a lower price than Europe, which is an additional reason why America should consider dropping the differential on small cars.

Brakes—On this subject American design seems to be at a standstill, and European design better almost without exception. The good point about the American design is that both brakes are generally on the rear wheels, but this is cancelled in most cases by lack of an equalizing device.

The bad points appear to be that the external brake, which is relied on to do the work, is in effect little more than the old-fashioned strap brake tried and abandoned on bicycles. It is likely to grab, is only approximately balanced, is unequal in its application, springs a great deal before it really gets hold, is exposed to all the winds that blow and yet will heat up almost immediately. On very few cars does it ever really come free.

The internal, or so-called "emergency" brake, is generally no more than an enlarged piston ring and is best disregarded.

The smell of rubber and burnt string on any American highroad hill in the touring season is sufficient criticism of the local brake design, and the columns of the newspapers are its condemnation.

The means of applying the brakes too often consist of bent wire, and other things that spring, so that the driver cannot tell the moment at which his brakes make contact and simply keeps on pressing with his foot in the hope that something will happen soon. When it does, it often skids the wheels because the bands after slipping for a time have grabbed. Shrieking brakes are a minor symptom.

Brake facings in America do not appear to be the equal in wearing quality of those used in Europe.

The use of rods to the back axle instead of steel strip or cable, leads to rattling and frequent breakage.

One would imagine that the double internal expanding brake so often used in Europe could be made cheaper to manufacture than the general form of American band brake, since it consists of fewer parts and is a machine job from start to finish. It is better because it is weatherproof, will not run so hot, is more definite in its application, balances better and is more readily adjustable.

The side-by-side variety implies a wide drum, but a new type which is appearing lately, consisting of a single width drum with four internal shoes, each working on a quarter of the circumference, and controlled, one pair by the pedal and one pair by the lever, seems to solve this drawback.

Pressed drums can be used, but should be flanged outward on the inner edge for stiffness and cooling, and should be bored or ground to run true.

I wish to suggest that improvements on the lines suggested would form a great step forward in American cars.

Bodies—Much adverse criticism of American bodies has recently appeared in the English technical press, but when one examines it one finds that it applies wholly to the open-touring bodies, to which I imagine American manufacturers have not given much attention lately.

Recent American open bodies have aimed too much at sporting lines to be comfortable—they are not deep enough and the seating is too upright. I think the designs which are now criticized in Europe came originally from Europe in a number of cases. Europe now, however, has reverted to deep, comfortable, open bodies, such as were standard in this country before the war, using them all the year round, and therefore demanding the utmost of usefulness and comfort.

As regards closed bodies, however, this country undoubtedly leads by a very long margin in detail finish, in accessories, and one cannot help feeling, in general lines also.

The recent developments in quantity production of closed coach built bodies form another notable advance for which the States is responsible, and the quality of workmanship and material in these closed jobs seems to be at least as good as much of the custom coachwork of Europe.

America showed that the automobile was not the monopoly of the rich, and is now showing that true comfort in the automobile is equally available to the man in the street. In other words, what the public wants, it shall have.

The quantity production of coachbuilt bodies is a great step in advance, not only because of low price. By quantity production coachbuilding is lifted from an art to a mechanical science. It has been shown that wood can be worked accurately to make interchangeable parts, that it is capable of proper heat-treatment, like metal, and that results can be guaranteed.

The individual coachbuilt body is often a nuisance to the manufacturer of the chassis and the owner of the car, because it is so often found that in some particular the bodywork clashes with the mechanism of the chassis, or vice versa. By the quantity production of bodies such interference can be rooted out in the first experimental sets, electric wiring can be standardized, and a whole host of minor annoyances can thus be avoided.

Probably in Europe the open car will always hold the field because of the difference in climate. In any case, any form of covering for European cars will have to be truly collapsible.

Perhaps America will now show that a really convertible job can be produced in quantities, which will not rattle and which can be thrown wide open in the fine weather, and covered again by two persons in five minutes.

European, and particularly English, closed body designs appear to be going through a phase which one hopes may be temporary. The rear end of a number of English bodies resembles the rear end of a sausage in general design. I refer to the excessively rounded designs which are so popular in England just now and which appear so hideous to American eyes.

In touring cars the European designs are almost uniformly good, except that in some cases the desire for a disappearing hood has spoilt the lines of the car.

Aluminum sheet is now used extensively in European body work, but the treatment is not as complete as in American bodies, and exposed wood joints are used in window framings, etc., which are likely to give trouble in the event of a change of climate.

Aluminum roofs, used to obtain the rounded designs referred to above, are not satisfactory in many instances, as they tend to boom badly and they make the interior uncomfortably hot in summer weather.

As a summary I wish to emphasize the following points:

1. The use of cars is radically different on the two sides of the Atlantic, and selling points which are vital to the American public, such as self-starters, transmission locks, service organizations, etc., are of secondary importance in Europe.
2. The cost of running a car is greater in Europe and the roads are good; therefore, cars are growing smaller, and it is the small car above all things which appeals to the general public, especially in England.
   If America wishes to hold a big trade in England, she must evolve small, fast, economical cars of the utmost refinement as regards mechanical parts.
3. American bodywork, as known in Europe, is unsatisfactory. But actually American bodywork, as a whole, is of a higher quality than the European. It only remains for America to turn her attention again to producing comfortable **touring** bodies, for her to meet European requirements absolutely in this respect.
4. American brakes need entire redesigning from the pedal or lever to the back axle, if they are to meet European ideas. The idea of the hand brake being an "emergency" brake must be eradicated. If it is only to be used in emergency, the driver never accustoms himself to use it, and in an emergency it is never ready.
   It is immensely better to call it a hand brake, make it adjustable for wear and build it for use. It only remains to train drivers to use it frequently on all long hills, and it will then be used in emergency and may prevent a lot of accidents.
5. As regards detail design, Europe does not appear to know anything that America doesn't know. With the exception of the overhead camshaft engines, the small horizontal two-cylinder engines, the Argyll single sleeve and the Ricardo trunk piston, every European design is reflected strongly in the States.
6. If America were to build light cars on European lines for export, I believe they would be found to sell in large numbers in the eastern part of the United States, where road conditions are ready for them.
   These cars must not be built for use in cities only, however—they must have the speed and capacity for touring equal to the largest cars built in this country.

Finally

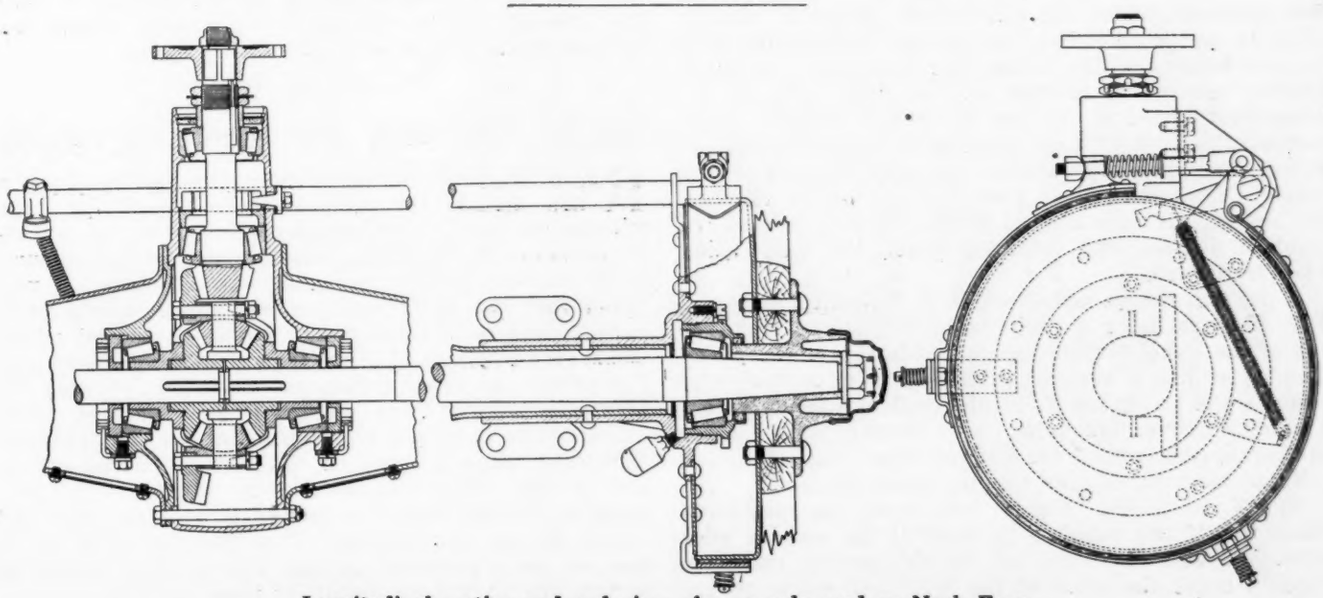
The outlook for American cars all the world over appears to me to be particularly good, because the States is now aiming not only at production, but at the production of high quality designs.

In recent American designs, equal compression volumes are often insured by machining the heads, six-cylinder crankshafts have seven bearings and are finished all over in the circular grinder, pressure lubrication is used for all moving parts of the engine, and in all ways the highest practice is aimed at, combined with strictly mechanical methods.

Other countries are trying to get the costs down, while America, having got the costs down, is trying to get quality up without increasing the costs.

It seems to me that it only remains for America to produce cars strictly suitable for European conditions, to gain a firm place in the esteem of European users.

There is no doubt that having gained a place in the regard of the European public, American salesmanship and service organization will see that the place is retained.



Longitudinal section and end view of rear axle used on Nash Four

Elbow Lines of European Cars

Many methods employed in finishing off top edge of body sides. General tendency is toward construction in which side panel is continued over the top edge to meet the upholstery. Padded top edge is disappearing.

By M. W. Bourdon

MANY efforts on the part of body builders to provide something distinctive in the top edge or elbow line are to be seen on European cars, and the accompanying sketches serve to indicate how widely diverse have been the aims and ideas of various designers.

The bolster-like effect produced, as shown in Fig. 1, by continuing the upholstery fully padded over the top edge, a finish at one time so popular, occurs very infrequently and its decline is not regretted from a practical point of view, as obviously with the full "freeboard" represented by a height of 10 to 14 in. from uncompressed cushion to top edge no use could be made of the padding as an elbow rest.

The general tendency is toward the finish shown in Fig. 2, where the side panel is continued over the top to meet the upholstery. There are a few instances where the latter cannot be seen from outside the car even when viewed from above at an angle of say 45 deg.; but this full extension of the panel has not found much favor, the general endeavor being to interpose a certain amount of padding between the unyielding parts and the passengers, even at this height. This endeavor is more or less apparent in all standard jobs, though in the "sporting" type of body the comfort of the occupants is sacrificed, presumably to obtain a racy effect.

Many body designers are reluctant to discard entirely the padding continuation to the outside edge; Humber and Arrol Johnston go so far as indicated in Figs. 3 and 4 respectively. In both cases the junction between leather lining and panel is finished off by a lead-filled metal beading, Humber securing the lining with pins into the frame and interposing a double strip of leather binding which has a small roll formed by its fold projecting below the metal bead. Angus Sanderson (Fig. 5), on the other hand, eliminates the metallic beading and finishes off the lining edge with a strip of fabric binding secured by leather covered gimp tacks, an arrangement liable to become distinctly "shabby" after comparatively short use. The sketch shows the distinct roll of the upholstery inside the top edge favored by this maker. A similar roll is used on Vinot bodywork (Fig. 6), but in this case a solid aluminum strip covers the joint of leather and inturned panel, the strip being black enameled.

A peculiar design is that on D. F. P. bodies, shown in Fig. 7, there being a pronounced step down from the top of the upholstery to the curved-in top of the panel. The latter has a vertical extension to meet the outer edge of the lining, and a double roll of patent leather binding to cover the joint. This arrangement has the clumsy appearance of the bolster edge (Fig. 1) and is without advantages over simpler constructions.

The F. N. design (Fig. 8) can hardly be considered ideal for, if the panel is finished at the outside edge vibration and distortion of the framework must obviously break the paint at the joint and cause an unsightly crack to occur. If the flat band be formed of a separate strip of metal welded on to the side panel, a comparatively expensive job would result. It must be admitted, nevertheless, that so far as appearance goes this finish has points in its favor, though the sharp outer edge would hardly be serviceable under rough usage, and there are other designs which appeal more forcibly even in appearance.

The edging used on the Phoenix body (Fig. 9) gives a neat and distinctive finish, with a simpler form of panel than is needed when the latter is rolled over to meet the lining. The panel finishes under the lead-filled beading, the rounded top edge being a moulding of wood secured to the framing. The arrangement shown in Fig. 10 (Swift) somewhat resembles the Phoenix in utilizing a moulding above the frame to carry over from panel to lining, but here a solid aluminum bead is screwed on to form the uppermost edge. This design is not so sightly as the Phoenix, for the inclined flat "band" does not harmonize with anything; it clashes with the curvature of the panels and the outline of the body.

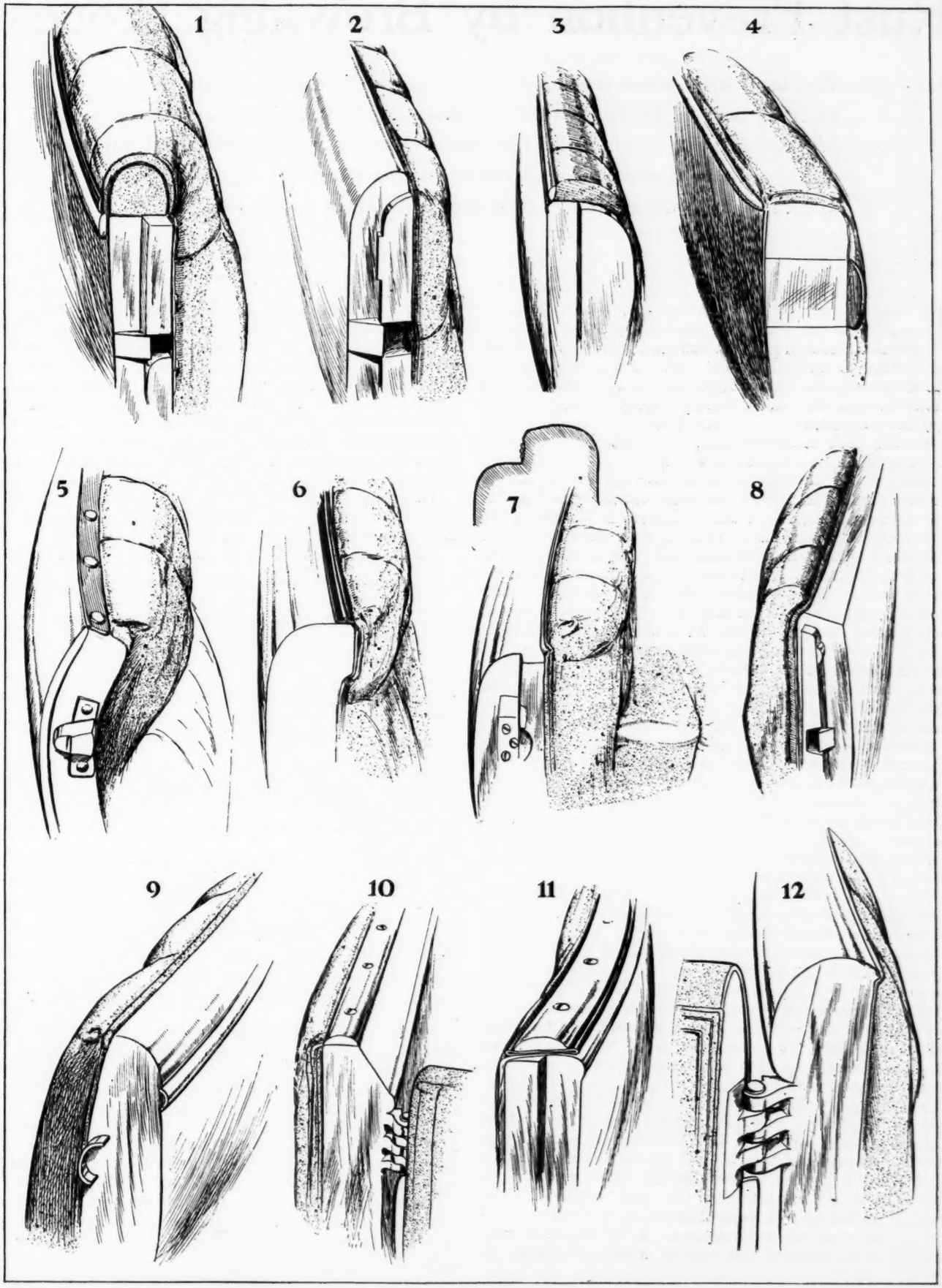
The Hillman design (Fig. 11) also embodies a polished aluminum band with a doubled leather strip beneath it to form a beading on either side. But this scheme looks cold and the "relief" it affords is not called for.

In Fig. 12 an idea is given of the Armstrong-Siddeley top edging. The panel finishes under the broad (2½ in.) half-round moulding, the latter secured to the outside of the top edge of the body framing. This moulding is finished in a slightly darker shade of paint and is a prominent feature of the body—rather too pronounced in the opinion of some people and tending to break up the lines of the body when, as in this case, it is used also (though of less width) at the corners, where the vertical joints of side and back panels occur.

Light Mirrors for Oscillographs

RECENTLY the Bureau of Standards has developed a new method for producing very small and light mirrors for use on oscillographs. Some time ago an attempt was made to produce these mirrors from aluminum, polishing the metal in the usual way. However, it was found that the metal was too soft to be satisfactorily polished and some other means had to be devised which would give a better and at the same time as light a mirror. The process, as finally worked out, consists in pressing the aluminum between two optically flat steel dies. The mirrors thus made are highly polished with the surfaces sufficiently plane to produce satisfactory images of the spot of light. The dimensions of the mirrors so far produced are approximately ½ mm. wide, 1½ mm. long, and .10 to .20 mm. in thickness. Care must be taken not to use too much pressure, as then the resulting mirror is so thin that it will not retain its plane surfaces.

Examples of Finish Used on Top Edge of European Car Bodies



Rust Prevention by Browning Process

Has been used extensively for many years for treating component parts of small arms. Produces a bluish black finish which is rendered dull by sand blasting or may be polished by buffing. Finish does not rub off, is not easily scratched and resists rust to a marked degree. Specifications for preparation of solutions and methods of application are given.

By W. C. Marshall*

IN looking over the back numbers of a prominent automobile periodical recently, the writer came across an article on rust prevention and read it with great interest. Much to my astonishment, no mention was made of the Browning process, although the process is old and used extensively by small arms manufacturers for treating barrels and component parts of small arms.

Having been connected with the works of a company manufacturing small arms in the capacity of research engineer, it fell to my lot to investigate the Browning process used in this plant and make recommendations for any changes. There had been considerable trouble in the browning room, and many rejections on account of poor browning, which the foreman said was caused by the weather. This was true to a very limited extent, because the browning depended principally on atmospheric conditions in this plant. Humidity is very necessary, either controlled or natural. In the above case it was a combination of both, the artificial regulation depending on the foreman, who did not believe in control and preferred to go by his own feelings in the matter of humidity. The time required for the whole process at this time was 96 hours. The first step in the investigation was to install automatic control of temperature and humidity and instruct the foreman to keep his hands off the valves. Recording instruments were installed to show how temperatures varied, and soon the system was working satisfactorily so far as the actual process went. The only failures thereafter recorded were due to someone trying to assist the automatic regulators by closing valves by hand and ruining whole batches of parts.

The question of browning solutions was then taken in hand, the object being to find the cheapest solution which would do satisfactory work.

Steel in a smooth or matt condition of finish is very prone to oxidize or rust if it is exposed to moisture either from the air or from the human skin. The air may carry hygroscopic particles of sodium chloride (or salt) which are deposited on the metal surface and act as a powerful oxidating agent. The exudation from the human skin may have an acid reaction which would start oxidation at once. To prevent this action in the presence of such conditions, it has been the custom of arms manufacturers to coat their products with an artificial coat of rust which will prevent the formation of any further oxides or rust. This coat is produced by acids and the operation of rusting is named "Browning," although the color produced is bluish black and not brown as the name indicates. The finish is smooth or dull, depending on the finish of the surface of the steel before browning. A dull finish is produced by sand blasting and a glossy finish by buffing. It does not rub off, scratches with difficulty and resists the rusting tendency of the air or hands to a marked degree. It wears off *very* slowly when subjected to a rubbing action, and the writer has a golf mashie head with dull finish which was browned in 1915 and still has the bluish black color intact all over its surface except on the face and lower edge where the head cuts into the ground in playing a shot. There has been no rusting except for a little on the face, in spite of the fact that the club has been badly cared for in not being wiped off nor oiled after using.

The process is adapted to all kinds of automobile trimmings, looks and wears better than most of the so-called rust preventatives, and is not expensive to use.

The operations of the browning process are as follows:

1. **Thorough cleaning of the parts** in a soda solution.
2. Applying the browning solution evenly.
3. Keeping the parts in a room at a fairly high temperature during the rusting process.
4. Boiling in water to reduce the high oxide of iron to a low oxide.
5. Carding or buffing the surface of the parts to remove loose particles of the oxides.

Cleaning of Parts

Cleaning of the parts is done by boiling in a solution of water and sal soda. This solution should contain from 5 per cent to 20 per cent of alkali. As an example, 7 cu. ft. of water should have 61 lb. of sal soda added to give a 5 per cent solution.

After cleaning, the objects are dried and the browning solution is applied with a brush or sponge or by dipping. They are then dried in the atmosphere, a second coating of solution is applied and allowed to dry 30 minutes, after which they are placed in a dry room heated to 170 deg. Fahr. for 30 minutes. This is done to bring them to a temperature not lower than that in the humid room in order to prevent condensation on the parts when placed in it.

The humidity of this room is kept at 60 to 70 per cent and its temperature at 160 deg. Fahr.

The work is kept here for 1½ hr., the object being to hasten the rusting under the most favorable conditions, viz., high temperature and high humidity.

At the end of the rusting period, the pieces are boiled 15 minutes in clear water, dried and carded. Then they are painted again with the browning solution, dried, heated in the dry and humid rooms, and boiled. This process is repeated twice, making five coats of browning solution in all. The whole time consumed in the process is 11 hr. 28 min., divided into 31 operations as shown in the accompanying table.

The success of all the processes depends on the cleanli-

*Consulting Engineer.

1. Boiled in soda water	15 m.	17. Cooled and dried	5 m.		
2. Boiled in clean water	10 m.	18. Carded and painted	5 m.		
3. Cooled and dried	5 m.	19. Dried	10 m.		
4. Painted	5 m.	20. Dry oven	30 m.		
5. Dried	30 m.	21. Humid room	1 hr. 30 m.		
6. Painted	5 m.	22. Boiled	10 m.		
7. Dried	30 m.	23. Cooled and dried	5 m.		
8. Dry oven	30 m.	24. Carded and painted	5 m.		
9. Humid room	1 hr. 30 m.	25. Dried	10 m.		
10. Boiled	10 m.	26. Dry oven	30 m.		
11. Cooled and dried	5 m.	27. Humid room	1 hr. 30 m.		
12. Carded and painted	5 m.	28. Boiled	10 m.		
13. Dried	10 m.	29. Cooled and dried	5 m.		
14. Dry oven	30 m.	30. Carded	5 m.		
15. Humid room	1 hr. 30 m.	31. Oiled	3 m.		
16. Boiled	10 m.		11 hr. 28 m.		

ness of the surfaces and the temperature and humidity of the air during the periods of oxidation. The control of temperature and humidity should be automatic if possible, as a slip in either one means failure of the process from the standpoint of uniformity in product. Carding is also an important part of the process. The wheels used are of fiber or wire or card cloth on wheels or belts.

Solutions

Browning solutions are made by combining many different chemicals, the object being to obtain a solution which will oxidize rapidly. Some solutions are considered very secret, but, so far as the author's experience goes, they are no better than any one of the half dozen listed below, which were experimented with for competitive purposes.

Eleven different solutions were tried on eleven different pieces of buffed gun barrels, numbered as follows:

1. R No. 1	5. Springfield	9. No. 5
2. R No. 2	6. Enfield	10. No. 6
3. Exper. No. 1	7. Scientific Receipts	11. Henley
4. Ponsot	8. No. 4	

The barrel samples were treated and the results in order of merit were as below. The determination of merit of the 7 good samples amounted in this case to the estimate of worth by several good judges of browning, to whom the samples were submitted. Any one of the following solutions can be used with good results, although they are arranged in their order of merit.

The cost per gallon of the solutions in 1916, based on alcohol at $3.16 per gallon, is shown in the table below, also their cost when using denatured alcohol (in brackets) at 60 cents per gallon.

1. Springfield	$0.90 (.77)	6. Ponsot	$3.38 (.86)
2. Exper. No. 1	.27		1.80 (Half water)
3. No. 5	1.45 (.43)		
4. R No. 2	.35 (.27)	7. No. 4	.86 (.86)
5. R. No. 1	.30		

The prices of other chemicals were:

Nitric acid	$0.11 per lb.
Iron chloride	.25 " "
Hydrochloric acid	.07½ " "
Bichloride of mercury	2.38 " "

Table No. 1

Browning Solution Formulae—Percentages by Weight

SOLUTION	Perchloride of Iron $FeCl_3$	Bichloride of Mercury $HgCl_2$	Sulphate of Copper $CuSO_4$	Nitric Acid HNO_3	Sp'ts of Nitre	Sulphate of Iron $FeSO_4$	Chloride of Copper $CuCl_2$	Hydrochloric Acid HCl	Chloride of Bismuth $BiCl_3$	Alcohol C_2H_5OH	Water
Springfield	3.9	1.2	0.6	1.8	6.2	...	...	...	...	4.0	82.3
Exper. No. 1	2.8	...	...	8.5	...	1.5	...	...	...	3.2	84.0
No. 5	8.9	...	...	...	...	...	...	...	...	40.1	51.0
R No. 2	2.1	0.7	0.7	6.4	...	...	...	...	...	2.4	87.7
R No. 1	2.8	8.5	1.5	...	...	...	...	...	...	3.2	84.0
Ponsot	7.0	...	...	4.3	...	0.5	...	7.5	...	78.2	...
No. 4	3.3	...	...	...	...	...	1.7	9.9	1.7	....	83.4

The Ponsot process used above was not the one indicated below, the solution being the same, however.

The true Ponsot process requires a dry oven heat of 248 deg. Fahr. and can be done in 6 hr. 30 min. The chemical composition of each solution is given in Table 1.

Chemistry of Browning

The chemistry involved in browning is complex, and chemists do not agree even on the simple facts. Ordinary iron rust or iron oxide is probably a mixture of ferric oxide, hydrated ferrous and ferric oxides, basic ferrous and ferric carbonates. After long exposure to the air, the amount of ferric oxide in the mixture becomes relatively large and the amount of other compounds relatively small. Rusting conditions may be varied. Dry iron in dry air will not rust, as moisture must be present before rusting can occur. It is affirmed by some that the presence of an acid and water is necessary, but this is denied by others. Evidence shows, however, that the presence of an acid is necessary for rusting.

Atmospheric rusting proceeds in the following manner. Films of moisture, holding carbonic acid and oxygen in solution, condense on the surface of iron exposed to air. An acid ferrous carbonate $Fe(HCO_3)2$ or a basic ferric carbonate $Fe(OH)_2(HCO_3)$ is first formed. The ferrous carbonate in contact with oxygen is oxidized to a basic ferric carbonate $Fe(OH)_2(HCO_3)$ or to $Fe(OH)(HCO_3)2$ or both. The basic ferric carbonate is then hydrolized by the water forming ferric hydroxide $Fe(OH)_3$, and the ferric hydroxide is subsequently more or less hydrated, forming ferric oxide.

Once rusting has started, the action is accelerated because the ferric oxide is hygroscopic. As the rusting goes on, the ferric oxide increases in quantity and with it the amount of moisture. Near the sea coast there is more or less sodium chloride in the air. This is in the form of small particles like dust. Sodium chloride is very hygroscopic; therefore, any particles of it which settle on an iron surface not only cause the above conditions, but also remain in the film as a powerful oxidizing agent.

Since atmospheric conditions are too uncertain to depend upon for commercial purposes, a combination of a number of oxidizing agents can be used in place of sodium chloride, such as oxygen, ozone, the feroxides, the oxyacids and their salts, such as nitrous, nitric, chromic, chloric, etc., and the halogens, chlorine, bromine and sodium, permanganic acid and its salts, viz., potassium, ferricyanide, etc.

Among the references used are Mellor's Modern Inorganic Chemistry, Newth's Inorganic Chemistry, and Remsen's Chemistry.

Inasmuch as the Ponsot process differs from the one described previously, it is described at length as follows in case some one desires to make use of it.

Ponsot Process

The Ponsot Process of browning produces a rapid oxidation of steel, usually by the application of two coats of a special solution.

1. Manufacture of the Special Solution.

The composition of the solution is as follows:

Nitric acid at 40 deg. Baume	65 cc.
Commercial hydrochloric acid	130 cc.
Chloride of copper	10 grams = 0.3537 oz.
Iron filings	Necessary quantity
Perchloride of iron at 45 deg. Baume	100 cc.
Commercial alcohol	2 liters = 2.113 qts.

In the dipping process the coats are applied by dipping the pieces directly into the solution.

If the coats are to be applied by means of a sponge or brush, the composition of the solution is modified by re-

placing one liter of the alcohol by one liter of water.

To prepare the solution place the chloride of copper in a porcelain vessel; on this pour the nitric acid, then the hydrochloric acid. When the copper salts are dissolved the iron filings are added in small quantities, very slowly at first and then more and more rapidly, being stirred with a glass rod. The quantity of iron filings should be sufficient completely to neutralize the acids; the reaction is complete when the red vapors become white. It is essential to use an excess of iron filings to make sure that the solution shall be completely neutral. At this time the perchloride of iron is added, then the alcohol (or the alcohol and water).

The bath is now ready for use without filtration.

Care must be taken to stir at the time of use.

2. Browning.

The necessary successive operations for browning are as follows:

(A) Cleaning components of grease or fats.

(B) Applying and fixing the first coat, comprising:

1. Applying one coat of solution by dipping or by sponge or brush.
2. Placing the pieces in dry oven at 248 deg. Fahr. (120 deg. C.) or first heat (for an average time of 20 m.).
3. Placing the pieces in steam oven at low pressure (for 20 m. exactly).
4. Placing the pieces in dry oven at 248 deg. Fahr. (120 deg. C.) or second heat (for same length of time as for first heat).
5. Placing the pieces in bath of boiling water (for at least 20m.).
6. Wiping or drying the pieces with sawdust.
7. Scratch-brushing.

(C) Applying and fixing the second coats, comprising exactly the same operations as the first coat.

(D) Greasing the pieces.

These various operations are explained in detail below.

Removing Grease and Fats From Components Before Browning

No special process is necessary. The one in use in French plants may be used, namely: Immersion of the pieces for 20 m. in a bath of boiling water containing .500 kg. (1.1 lb.) of carbonate of potash in 100 liters (26.417 gal.) of water, followed by a cleaning with whiting.

Applying the Coats of the Solution

It is important that the coats be regular and perfectly uniform. The best process is by dipping. The piece is immersed and immediately taken out with a sharp shake to prevent the formation of a drop. This precaution prevents the excessive erosion of the metal where the coat is thickest, and grooves and etchings are avoided.

The coats may be applied by means of a sponge or brush. The solution may then contain water to prevent too rapid an evaporation of the coat, which would occasion excessive thickness. The trials made at the St. Etienne factories with the sponges used in the old regulation browning process have not given good results; in spite of precautions taken to dampen the sponges, the coat was not very uniform and the pieces showed marbled surfaces. (The operators were not very expert.)

With a pure alcohol solution, the drying is instantaneous and the pieces may at once be placed in the ovens at 248 deg. Fahr. (120 deg. C).

With an aqueous solution it is necessary to wait about 30 min. so that the pieces will be dry before being put into the oven.

Placing the Components in the Dry Oven at 248 Deg. Fahr. (120 Deg. C.)

(First or Second Heating)

The oven may be of any model, the sole conditions being that it can produce a uniform heat at 248 deg. Fahr. (120 deg. C). The pieces should stay in an average time of 20 min. It is essential that only pieces having approximately the same weight be placed in the oven together so that all will heat uniformly.

The design of these ovens depends on the number of pieces they must hold.

Placing in the Steam Oven at Low Pressure

The components should be placed in this apparatus on coming out of the oven at 248 deg. Fahr. (120 deg. C.), but after a certain amount of cooling, to about 122 deg. Fahr. (50 deg. C.). It is essential that all pieces be of the same temperature at this moment, the weight of the pieces being the same. The design of the oven is determined by the number of pieces to be placed therein. A closed tank may be used, into which is poured each time a fixed quantity of boiling water. This water should be drained off after each operation.

The object of this apparatus is to produce steam at about 140 deg. Fahr. (60 deg. C) and to let the pieces cool to about 86 deg. Fahr. (30 deg. C). The parts should remain in the apparatus for 20 minutes.

Placing the Pieces in Bath of Boiling Water

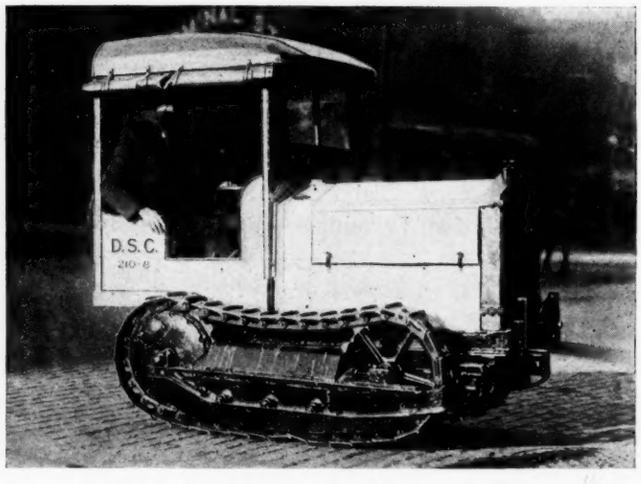
This operation is the same as in the regular Browning process, the parts remaining in the water 20 minutes.

Scratch Brushing

For this purpose it is necessary to use brushes of steel wire, the diameter of the wire not exceeding 1 mm. 0.040 in.

The detail work of the experiments was carried out by my assistant, W. D. Carpenter, and the results of their application to the work in the plant were most satisfactory in every way. The construction of cabinets or heating rooms depends on the requirements of each individual plant and the supply of air and moisture to these rooms depends on the facilities available. In any case, the control of the air supply should be automatic and positive.

Tractors in Snow Removal Service



One hundred of these Cleveland tractors were used in an effort to clear New York City streets of snow after the recent storm

Status of Commercial Aircraft Shown by Company Development

Yes, there is an actual development of commercial flying. This list of flying companies shows that there is the beginning of a transportation service in the air. Data on landing fields especially interesting.

THE fact that there are in this country 21 commercial aircraft operating companies that have flown 25,000 or more miles each will probably surprise most persons who are interested in aircraft development. Thirty companies have exceeded 1000 passengers. These figures are illuminating as to the progress made in aircraft transportation. It is interesting also to note that there is apparently a basis for charge for flight, in that the rates charged by these companies range below $1 per mile, but near that figure, although in one or two cases the charge drops as low as 60 cents per mile. It will be noted also that several of these companies are making progress in the amount of freight carried, 25,000 lbs. having been carried by one company.

The following tabulation is taken from advance proofs of the "1921 Aircraft Year Book" published by the Manufacturers' Aircraft Association, Inc.:

	Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas.-Mile Inter-City Flight	Passengers Carried	Freight Carried lbs.	Miles Flown
1	Aerial Tours Co	Seattle, Wash.	1 B.B.-L‡ 1 J.N.-4	Field (rented) and hangars at Kent, Wash.	$15.00	$1.00	1,700	.....	31,500
2	Aeromarine Sightseeing & Navigation Co. (Merged with Aeromarine West Indies).	86th St. and Riverside Drive, N. Y. City.	2 F.-5-L Navy Cruiser Flying Boats;‖ 2 50-B.-2 Flying Boats	Terminal at 86th St. and Hudson River.	....	.83	800	.....	7,000 (est.)
3	Aeromarine West Indies Airways, Inc.	Key West, Fla.	6 F.-5-L Navy‖ Cruisers (14-passenger)	Terminals in harbors at Key West and Palm Beach, Fla.; Havana, Cuba; Bimini and Nassau.	....	75.00 between Key West and Havana	300	.....	7,200
4	Aero Limited.	20 W. 34th St., N. Y. City.	15 5-passenger H.S.-2-L Flying Boats.	Air ports (owned) at Flushing and Miami.	10.00 to 25.00	.60	4,376	1,500	200,000
5	Air Service, Inc.	536 Broad St., Newark, N. J.	1 Canadian J.N.-4 OX5 motor.	Field 1500x3000′ (leased); 1 hangar under construction.	10.00	.85	1,473	.....	13,800
6	Air Transport & Photographic Co.	302 Sloan Bldg., Cleveland, Ohio.	1 Canadian J.N.	Field (leased); test hangar; hangar for 10 machines and repair shop.	....	....	.....	.....	Unknown
7	America Transoceanic Co.	505 Fifth Ave., N. Y. City.	1 H.-16; 1 H.S.; 3 Seagulls; 1 F Boat.	Pt. Washington, L. I.; Palm Beach and Miami, Fla.; Bimini and Nassau, Bahama.	10.00 to 15.00	.46	4,000	.....	80,000 (est.)
8	Augusta Aircraft Co., Inc.	Augusta, Ga.	2 J.N.-4-D's.	Field (owned); hangar and supply depot.	....	1.00	1,000	.....	15,000
9	Beaty Aviation Co.	Dallas, Tex.	2 J.N.-4-C's.	Field (owned) at East Dallas, end Gaston Ave., Dallas, Tex.; shop and repairs.	10.00	.40	515	.....	6,120
10	E. B. Bridges.	Anderson, Ind.	1 J.N.-4-H.†	Field (rented) 32 acres; tent hangar, supply depot.	15.00	50.00 (an hour)	278	.....	8,100
11	Canadian Aerial Services, Ltd.	Hempstead and St. Lawrence Blvd., near Montreal, Canada.	1 504-K 1 J.N.-4-C	1 hangar at Hempstead for 2 machines: 1 hangar at St. Lawrence Blvd. for 1 machine. Fields at both (rented).	10.00	.75	445	240	9,280
12	Canadian Aircraft Co., Ltd.	Winnipeg, Canada.	3 504-K's; 2 Canadian J.N.-4's.	Field with hangar and shop at St. Charles, Winnipeg.	10.00	1.00	1,500	600	12,000 (est.)
13	Cassell Motor Co.	Santa Fe, N. M.	1 J.-1.†	Field (owned) with 1-ship hangar, equipped with repair shop, gas and oil facilities.	12.50	1.00 per min.	200	200	10,000
14	Chattanooga Auto Co. (Aerial Depot)	Chattanooga, Tenn.	3 Canadian J.N.'s. 2 J.N.-4-D's; 1 J.-1; 1 Oriole K.-6.	Field (leased), hangar supply shop.	15.00	.75	.....	.....	.....
15	Checkerboard Airplane Service	Forest Park, Ill.	7 Canadian and American J.N.'s and J.-1's.	Field (owned), 1 hangar, 8-plane capacity, service depot complete.	$10.00	.50 to .70 per mile	2,000 (est.)	.....	25,000 (est.)
16	Chenoweth Aviation Co.	Richmond, Ind.	1 J.N.	Field (owned), with hangar for 3, shop and supply depot.	10.00 to 15.00	....	300	.....	3,500 (est.)
17	Chester R. Clark Aerial Service Co.	1563 Franklin St., Oakland, Calif.	2 OXX6 J.-1's; 1 float.	2 fields (owned); 2 hangars (one under construction).	1.00 per min.	1.00 per min.	1,476	.....	15,000 (est.)
18	Cincinnati Aircraft Co.	Duck Creek Rd., Cincinnati, Ohio.	2 Canadian J.N.'s.	Field (owned) 2680x2900 ft.; hangar 50x125 ft.	15.00	....	400	.....	4,000 (est.)
19	Colorado Aviation Corp.	Glenwood Springs, Colo.	1 J.-1. 1 monoplane*	1 field (leased).	12.50	.50	1,500	.....	28,000
20	Concord Aircraft Co.	65 N. Main St., Concord, N. H.	1 Canadian J.N. 1 504-K.	1 field (rented) with hangar, shop, office.	10.00	.80	500	.....	10,000
21	Connecticut Aerial Navigation Co.	886 Main St., Bridgeport, Conn.	Seagulls M.F. Boat	Seaplane base (leased) with hangar and storage facilities, etc. Black Rock Harbor, Bridgeport; landing field 3 miles east of Bridgeport.	1.00 per min.	1.00	582	.....	7,000
22	Curtiss Aeroplane & Motor Corp. (Main Company).	Mitchel Field, Mineola, L. I., New York.	Orioles, J.N.'s, J.-1's, Seagulls, Eagles.	Field (owned) mile square near Mineola; hangars, supplies, etc.	15.00	1.00	1,000	.....	25,180

KEY TO AIRCRAFT AND ENGINE TYPES

50 and 50-B-2, three-place flying boats, Aeromarine engine; F.-5-L Navy Cruiser, fourteen-place flying boats, Liberty engine; built by Aeromarine Plane and Motor Company, Keyport, N. J.

B.B.-L., three-place land plane, Hall-Scott engine; B.-1, two or three-place flying boat; C, twin float seaplane; built by Boeing Airplane Company, Seattle, Wash.

J.N.'s of the various types, two-place land planes; Oriole, three-place land plane; Seagull, three-place flying boat; F. and M.F., two and three-place flying boats; Eagle, ten-place land plane; H.S. and H.-16, six to sixteen-place flying boats; OX, K and C engines; Liberty engines in larger types; built by Curtiss Aeroplane and Motor Corporation, Garden City, L. I., New York.

K.T., two-place land plane; O.W., three-place land plane, Liberty engine; built by Dayton Wright Company, Dayton, O.

J.1 and J.-2, two and three-place land planes built by Standard Aircraft Corporation, Elizabeth, N. J., and rebuilt by Curtiss Aeroplane and Motor Corporation or others.

† indicates Wright engine built by Wright Aeronautical Corporation, Paterson, N. J.

‖ indicates Liberty engine built by Packard Motor Car Company, Detroit, Mich.

‡ indicates engine built by Hall-Scott Motor Car Company, Berkeley, Calif.

F.40 and F.46, French Farman; J.L. monoplane, German Junker; 504-K, British-Avro; * Lark monoplane; ** French Breguet; *** Daugherty tractor; °Laird landplane; °°British Bristol.

The operating companies report a total of 222 forced landings and 88 accidents.

(The above is based upon statements made to the Manufacturers Aircraft Association, Inc., in response to questionnaires sent to all known operators of aircraft. No opportunity has been available to determine the accuracy of the information and no responsibility is taken for the data except for the care with which the figures and facts are reported and the manner in which the summary is presented

	Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas.-Mile Inter-City Flight	Passengers Carried	Freight Carried lbs.	Miles Flown
23	Curtiss Aeroplane & Motor Corp. (Western Branch)	30 N. Michigan Blvd., Chicago, Ill.	Orioles, Seagulls, J.N.-4-D's, Canadian J.N.'s, J.-2's, Eagles.	2 fields (leased) at (1) Sheridan Rd., north of Waukegan; (2) Roosevelt Field at Des Plaines River.	10.00	....	125	.....	1,600
24	Curtiss Eastern Airplane Corp.	130 S. 15th St., Philadelphia, Pa.	4 Orioles; 1 Seagull; 2 J.N.-4-D's.	Landing field with 2 large hangars, repair shop, office, etc., at Pine Valley, N. J.	10.00 to 15.00	.75	1,000	.....	102,000
25	Curtiss Exhibition Co.	Kenilworth Field, Buffalo, N. Y.	2 Orioles; Canadian J.N.; 4 J.N.'s; 2 K.-6 J.-1's; 1 OX J.-1.	1 field (rented) northeast of Buffalo, with 2 hangars, shop, etc.	15.00	1.00	1,035	.....	18,000
26	Curtiss Flying Station	Atlantic City, N. J.	1 C.-6 Seagull; 4 K-6 Seagulls; 2 J.N.'s; 1 K.-6 Oriole	Seaplane base at inlet and airport (both owned); 1 seaplane hangar, 200x100; 2 field hangars 8-machine capacity, shop, etc.	15.00	1.50	2,700	.....	30,000
27	Curtiss-Humphreys Airplane Co.	Denver, Colo.	5 Orioles; 3 J.-1's.	Field (leased), hangars, shops.	12.50	1.00	3,500	.....	35,000 (est.)
28	Curtiss-Indiana Co.	Kokomo, Ind.	20 to 30 planes; J.N.-4-D, Canadian J.N., J.-1, Orioles, Bomber.**	80-acre field (leased), ¼ mile southeast Kokomo, with hangars, shops, etc.	15.00	.50 to .75	12,000 (total)	.....	500,000
29	Curtiss Iowa Aircraft Corp.	Fort Dodge, Iowa.	4 Orioles; 6 J.N.'s.	63-acre field (owned), Fort Dodge; 160-acre field (leased), Des Moines; hangars, shops, service stations both fields.	10.00	....	.....	.....	.....
30	Curtiss-New York Aircraft Corp.	319 Main St., Buffalo, N. Y. and 505 Fifth Ave., N. Y. City.	16 planes; Seagulls, Orioles, J.N.'s, J.-1's.	Fields (owned) N. Y. City (Mineola, L. I.) and Buffalo, N. Y.	....	....	.....	.....	.....
31	Curtiss Northwest Airplane Co.	707 Metropolitan Bank Bldg., Minneapolis, Minn.	6 J.N.-4-D's; 6 J.-1's; 3 Orioles.	Field (owned) 880x440 yds., between Minneapolis and St. Paul; cor. Snelling and Larpenteur Aves.; 2 hangars for 8 ships and 4 ships respectively; 2 shops.	....	....	3,000	800	250,000
32	Curtiss Southwest Airplane Co.	Tulsa, Okla. Ft. Worth, Tex. Dallas, Tex. Houston, Tex.	3 K.-6 J.-1's; 2 K.-6 Orioles; 5 OX5 J.-1's; 6 J.N.-4-D's; 4 Canadian J.N.'s.	Terminals at Tulsa, and Ft. Worth, 160 acres each with hangars, shops, supply depots (both owned); fields (leased) with supply depots at Dallas and Houston.	10.00	.80 to 1.00	1,500 (est.)	8,400 (est.)	25,000 (est.)
33	Earl P. Cooper Airplane & Motor Co.	San Francisco, Calif.	3 Orioles; 2 J.-1's; 1 J.N.-4-D.	Field (leased).	10.00	1.00	944	.....	40,500
34	Earl S. Daugherty	Long Beach, Calif.	1 J.N.-4-D; 1 Cand. J.N.; 1 tractor.***	Field (owned) with 3 hangars and supply depot.	10.00	.75	4,300	.....	45,000 (est.)
35	Dayton Wright Co.	Dayton, O.	1 K.T.; 1 O.W.	Field (owned) with hangars, supply depot, shops, etc., at Moraine City Dayton, Ohio.	....	....	250	.....	10,800
36	DeLuxe Air Service, Inc.	Deal, N. J.	4 Canadian J. N.'s.	Fields (rented) at Deal and Spring Lake, N. J.; hangar and shop at Deal.	10.00 to 15.00	.75	500	.....	20,000
37	Dixie Flying Corp.	Birmingham, Ala.	J.N.'s.	Field (owned), hangar, etc.	....	....	400	.....	4,500 (est.)
38	Eastern Aircraft Corp.	340 First St., Boston, Mass.	J.N.-4's.	Fields (rented) at Boston and Springfield; latter station fully equipped.	10.00	1.00	.....	.....	30,000 (est.)
39	Finger Lakes Air Service, Inc.	Auburn, N. Y.	1 H.S.-2 Flying Boat		....	....	235	.....	2,000 (est.)
40	Ft. Wayne Aviation Co.	Ft. Wayne, Ind.	2 J.-1's	Field (owned) 80 acres, with hangars, supplies, etc.	15.00	.80	150	.....	1,500 (est.)
41	L. D. Frint Aeronautical Co.	Milwaukee, Wis.	1 J.N.-4-D; 1 Canadian J.N.	Field (rented) and large hangar.	10.00	.75	500	.....	15,000 (est.)
42	Valentine Gephart, Inc.	Kansas City, Mo.	16 planes; J.N.-4's J.-1's.**	Field (owned) 100 acres, hangar 100x200 ft., shops, etc.	10.00 to 15.00	1.00	.....	.....	420,000 (est.)
43	Goodyear Tire & Rubber Co.	Akron, Ohio.	1 Pony Blimp, 3 place.	Airship stations (owned) at Akron, Los Angeles and Avalon, Catalina Islands.	....	....	400 (est.) (at Los Angeles)	.....	6,000 (at Los Angeles)
44	Green Bay Aero Club	Green Bay, Wis.	1 J.N.	Field (owned) and hangar with supply depot.	10.00	....	500	.....	5,000
45	Gulf States Aircraft Co.	Shreveport, La.	4 planes; J.-2's and J.N.'s.	Use State Fair Grounds, Shreveport, La.	10.00	.75	1,000	.....	20,000
46	Fred'k. H. Harris	Brattleboro, Vt.	1 J.N.-4-D.	Uses Fair Field one mile north of Brattleboro.	15.00	1.00	100	.....	2,000
47	Heddon Aviation Co.	Dowagiac, Mich.	2 Canadian J.N.'s; 1 Swallow.°	Field (leased), 40 acres, with hangar and supply depot.	10.00	....	.....	.....	6,500
48	Holbrook & MacLeod	Hanna, Atlanta, Ga.	1 J.N.-4.	Field (leased) at Hanna, Atlanta, Ga.	$10.00	$ .75	1,200	.....	40,000
49	Hubbard Air Transport Co.	Seattle, Wash., and Victoria, B. C.	2 B.-1 Flying Boats.	Harbor Terminals at Seattle and Victoria.	....	....	25	.....	1,700
50	Jaquith Flying Station, Inc.	317 Guarantee Trust Bldg., Atlantic City, N. J.	2 Model 50-B Flying Boats.	Platform, office, etc., at Madison Ave. and Boardwalk.	15.00	1.50	1,500	.....	30,000
51	O. K. Jeffery Airplane Co.	Wilcox Bldg., Portland, Ore.	504-K and J.-1's.†	Field and hangars (owned) at The Dalles and Bend, Ore.	10.00	1.00	50	.....	500
52	LaCrosse Aerial Co.	LaCrosse, Wis.	1 J.N.4-D.	Tent hangar (owned).	10.00	.75	1,500	.....	15,000 (est.)
53	LaGrande Aircraft Co.	LaGrande, Ore.	3 J.-1's.†	Fields (rented) at LaGrande, The Dalles and Bend, Ore. Permanent station at La Grande.	10.00	.45	.....	.....	.....
54	Leschi Aerial Taxi Co.	Seattle, Wash.	Model C Twin float seaplane.	Harbor terminal at Seattle.	15.00	....	600	.....	9,000
55	David B. Lindsay	Marion, Ind.	3 Curtiss J.N.-4-D's.	Field (rented), with temporary hangar, etc., ½ mile south of Marion.	15.00	.75	927	.....	12,400
56	New York Aircraft Exhibition Corp.	Troy, N. Y.	1 Canadian J.N.	Field (rented) at Troy, N. Y.	15.00	....	300	.....	5,000
57	Floyd J. Logan Aviation Co.	Cleveland, Ohio.	2 Canadian J.N.'s. 1 J.N.-4-D.; 1 J.-1.	Field (leased) on Linndale Rd. near Cleveland; 3 canvas hangars for 10, phone, shop, supply, etc.	15.00	1.00	100	.....	10,000
58	Lynchburg Air Service Corp.	Lynchburg, Va.	2 J.N.-4-D's, Orioles, J.-1's.	2 fields (rented) near Lynchburg; one hangar and shop.	15.00	....	200	.....	3,500 (est.)
59	A. G. McMann.	Bettendorf, Iowa.	1 J.N.-4-D.	Field (owned) east of Bettendorf with hangar and shop.	15.00	....	500	.....	5,000 (est.)
60	Martin-Sweet Motor Co.	Denver, Colo.	3 J.-1's.†	Field (owned), 40 acres with 3 plane hangar and shop.	15.00	....	1,000	.....	20,000
61	Mercury Aviation Co.	Hollywood, Calif.	7 J.N.-4-D's, 2 J.-1's,† 2 J.L. monoplanes.	3 fields (leased), 2 at Hollywood, 1 Pasadena; 3 hangars at Hollywood, 1 Pasadena; repair shops.	5.00	....	15,000 (total)	.....	475,000
62	Morrow Aircraft Corp.	Charlotte, N. C.	1 Oriole, 1 J.N.-4-D, 1 Canadian J.N.	Field (owned) at Charlotte, N. C.	15.00	....	500	.....	7,500
63	National Airway Service Co.	217 Walsh Bldg., Akron, Ohio.	2 J.N.-4's.	Field (rented) at Akron, Ohio, with hangars, repair shops and supply depot.	10.00	....	.....	.....	.....
64	Northwest Aircraft Corp.	Newell, S. Dak.	1 J.-1.	Field (owned), hangar and shop; 30'x50'.	10.00	.50	100	.....	8,000
65	Ohio Flying School & Transport Co.	53 Central Office Bldg., Akron, Ohio.	5 J.N.-4's.	Field (owned) 8 miles northeast of Akron 80 acres; hangars, supply depot, shops.	15.00	1.00	586	.....	3,450
66	Oregon Washington & Idaho Airplane Co.	Portland, Ore.	3 Orioles, 2 Seagulls 4 F Boats, 5 J.N.-4-D's; 1 J.-1.	Terminals at Portland, Astoria, Seaside, Vancouver, Marshfield, Salem, Eugene, The Dalles; 12 hangars, shops, offices, etc.; Portland hangar accommodates 18 airplanes.	10.00	....	3,852	25,000	74,000
67	Orlando Aerial Co.	Orlando, Fla.	2 J.N.-4-D's.	Field (owned) 2 miles west of Orlando.	15.00	....	.....	.....	.....
68	Osgood & Stickney	Springfield, Vt.	2 J.-1's; 1 J.N.-4-D.	Field (rented) with hangar and supplies at Springfield.	15.00	....	3,000	.....	4,500 (est.)
69	Rankin Aviation Co.	Walla Walla, Wash.	1 J.N.-4, OX motor; 1 J.-1, OX motor.	Emergency field at Walla Walla.	1.00 min.	.50	862	.....	30,000 (est.)
70	Foster Russell Aviation Co.	Spokane, Wash.	1 Oriole; 1 J.N.-4-D, 1 J.-1.	2 fields (leased), one at Spokane and other at Walla Walla.	10.00	.50	1,500	.....	.....
71	Saginaw Aviation Co.	Saginaw, Mich.	1 J.N.-4-D, 2 J.-1's.	Field (leased), Saginaw East Side, 1 mile from city; hangars, shop, supplies.	12.50	.50	1,450	.....	15,000 (est.)
72	Santa Maria Aviation Co.	Santa Maria, Calif.	3 J.-1's.	Field (leased), at Santa Maria, Cal., ½ mile square; 1 hangar.	15.00	....	.....	.....	.....
73	Security Aircraft Co.	Minneapolis, Minn.	Orioles; J.N.'s; J.-1's; 504-K's.	Field (owned), Minneapolis; hangars, shops, etc.	15.00	1.00	3,900	.....	12,000

	Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas.-Mile Inter-City Flight	Passengers Carried	Freight Carried lbs.	Miles Flown
74	Service Aviation Training & Transportation Co., Inc.	Wabash, Ind.	11 Canadian J.N.'s.	Field (owned) at Wabash, Ind.; hangar 120'x65', shop, etc.	10.00 to 15.00	.75	9,355	.....	90,000 (est.)
75	Miss Neta Snook	828 Wilson Ave., Ames, Iowa.	1 J.N. biplane.	Air terminal at Ames, Iowa; hangar, supply station.	10.00 to 15.00	....	882	480	2,900
76	Starkey Battery Co.	Muskogee, Okla.	2 under construction.	Field (owned) west of Muskogee.	10.00	....	2	.....	20 (est.)
77	Southern Aeroplane Co.	11 S. Church St., Charlotte, N. C.	3 F.-40 & F.-46.	Terminal at Charlotte, N. C., and Fairmont, W. Va. (one owned, one leased); hangar and supplies at Charlotte.	15.00	1.00	1,249	1,100	20,000
78	Southern Wyoming Aircraft Co.	Cheyenne, Wyo.	1 J.-1.	Use municipal field, all supplies available.	15.00	2.00	500	.....	15,000
79	Syracuse Aero Corp.	239 Union Bldg., Syracuse, N. Y.	3 J.N.-4-D's.	Field (rented) northeast of city; hangar for 6 planes, service station.	15.00	.75	.....	.....	.....
80	Tahoe Aviation Co. W. S. Stoddard Aviation Co.	Lake Tahoe, Calif. Honolulu, T. H.	1 N.-9 seaplane,† 1 J.N.-4-D.	Fields (owned) at Lake Tahoe and Honolulu; hangars and runway (under construction) at Honolulu.	10.00	....	130	2,000	2,000 (est.)
81	U. S. Aircraft Corp.	1803 3rd Ave., Spokane, Wash.	4 J.-1's.	Field (owned) with 8-plane hangar, supplies, etc.; 1 minute from city.	10.00	1.00	551	.....	11,000
82	Utah Airplane Co., Inc.	343 S. Main St., Salt Lake City, Utah.	1 Oriole.	Field (rented), Salt Lake City.	12.50 to 15.00	.75	275	150	8,000
83	Vancouver Island Aerial Service	Comox Harbor, B. C.	1 J.N.-4-D converted to seaplane.	Use harbor floating-hangar and shop.	10.00 to 15.00	.75	283	600	11,000
84	Walter T. Varney, Aeroplanes	832 Post St., San Francisco, Calif.	6 J.-1's; 2 J.N.-4-D's; 1 Tourer.°°	Field (owned) at Redwood City, Cal., 2 mi.x¼ mi.; hangars and supply depot.	....	....	800	.....	45,500
85	Waterloo Aero Transportation Co.	Waterloo, Ind.	1 Canadian J.N.	Field (rented), 1-plane hangar, shop.	10.00	.75	350	.....	3,500 (est.)
86	Western Aeroplane & Motor Corp.	Casper, Wyo.	1 J.N.-4; 2 Orioles; 2 J.-1's.	Field (leased); hangar for 5 planes, complete shops, etc.	10.00 to 15.00	1.00	500	800	4,000
87	Yakima Aviation Co.	Yakima, Wash.	1 J.N.-4-D; 1 J.-1.	Field (owned), at 3rd St., So. Yakima, Wash.; 1 hangar, shop, etc.	15.00	1.00	2,520	.....	12,000
88	Zenith Aviation Co., Inc.	Santa Barbara, Calif.	2 Canadian J.N.-4's.	Field (leased) with hangars, supplies, shop, etc., at Ocean Blvd.; seaplane landing dock.	5.00	.50	1,400	.....	20,000
	Total.....		365 to 425	128	$12.50 (Aver.)	$0.65 (Aver.)	115,163	41,390 lbs.	3,136,550

Napier Cub Aircraft Engine

SOME additional details of the Napier Cub aircraft engine, referred to as the most powerful aircraft engine ever built, have come to hand. The engine has sixteen cylinders arranged in the form of an irregular cross, the two upper rows of cylinders being placed at as small an angle as possible (apparently 45 deg.) and the two lower rows making an angle of 90 deg. with the adjacent upper rows. Between the two lower rows the crankcase protrudes downwards to form a sump, and into the front end of that sump is cast the carburetor body, which comprises one float chamber and four mixing chambers—one mixing chamber for each row of cylinders. Half of the reduction gear housing is cast on the upper half of the crankcase. The cylinders are evidently very much like those of the Liberty engine, but have four slightly inclined valves in the head of each. Rocker arms protruding from the cam housing are employed for operating the valves, and a novel mechanism is said to be used for overcoming the side thrust on the valve stems which usually accompanies the use of this device. Three machined surfaces for bearing brackets are provided on the upper half of the crankcase on each side.

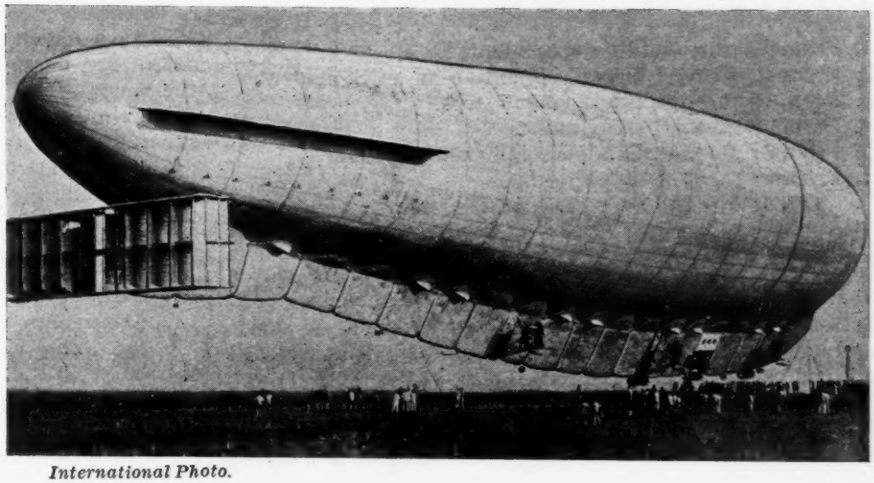
It is claimed that the Cub on its first test run showed an output of 1057 hp. The weight is said not to exceed one long ton, hence if the figure given is correct the engine weighs 2.24 lb. or less per nominal hp.

GREAT developments are predicted in French commercial air services, and it is understood that large grants are to be made to private enterprises engaged in the business. The Budget estimates for the present financial year are $10,660,000, and it is intended to ask for $15,550,000 for aviation requirements in the next financial year. Subsidies are to be given to companies operating services between Paris and London, Brussels, Toulouse and Monaco, and aerodrome facilities are being provided for airships and seaplanes at Marseilles, Algiers, Casablanca and Tunis, the intention being to establish services to North Africa. Consideration is also being given to the development of Constantinople as an air port.

Italian Airship Purchased by U. S. Army

THE Roma, here illustrated, is said to be the second largest semi-rigid airship in existence. It was recently purchased by the War Department from the Italian Government for $200,000. It is said that it would cost $1,250,000 to duplicate this dirigible here. The Roma is 410 ft. long and has a cruising radius at full speed of 3300 miles.

Except for the British Dirigible R-34, which is of quite different type, being, like the German Zepellins, of rigid construction, the Roma will be the largest airship to take the air over this continent.



International Photo.

Improved Service Obtained by Training Service Men

Every car that is sold must be kept "sold" until it stops running. The importance of service as a merchandising aid is increasing. This article describes how one large manufacturer is training competent service men for work on his product, thus insuring a uniformly high grade of service.

THIS interesting description of the work being done by one large automobile manufacturer in training service men was prepared by A. G. Bierma and read by F. J. Wells before a recent meeting of the Service Division of the N. A. C. C. It presents in detail the purposes of the course, the sources from which students are obtained, and the methods used in training them. The following transcript of the article is well worth careful attention:

The purpose of Pierce-Arrow Service Training is to supply men who are carefully selected and trained on our product, with whom to build up a competent service personnel among our distributors and thus insure as nearly as possible the uniformity and high quality of service, which is such an important factor in keeping our product sold and in making new sales.

From the practical standpoint, our training is based on the fundamental principle of educating through instruction plus practice—actual practical experience on the product under commercial conditions, plus lectures, personal instruction and examinations to insure a thorough understanding of the work covered and personal ability to handle the duties expected of the men in specific positions in our various distributors' service organizations.

From the individual's standpoint, our training is intended to give not only the mechanical knowledge required, and some skill through practice, but also personal development and the building of morale through personal contact and acquaintance with the factory, its organization and its personnel.

Sources of Candidates

Candidates for Service Training are obtained from the following sources, arranged in approximate order of greatest number of contributions:

1. From Factory fitting departments.
2. From or through direct application by letter or person.
3. From or through Employment Dept.
4. From or through Distributors.
5. From or through Roadmen and their reports.
6. From or through Advertising.
7. From or through Service Dept. Divisions.

Many of our most capable practical men have come to us from the factory fitting departments. This source has on the whole proved very satisfactory, because usually the men have been transferred on the basis of merit and more can be learned first hand of their demonstrated ability, personality and spirit.

A great many applications come through the mails from men who have either heard of our training or who know the reputation of the company and want to become associated with it. Many of these accepted have proved very satisfactory.

A few distributors and fleet owners have sent in men for regular or special training which has brought good results.

Candidates are selected through a semi-committee system. Their records of personal data and experience are first reviewed by the Director of Service Training either from the applications mailed in or by personal interview. In this way the likely candidates are separated from those unqualified. The final selections are then made or verified by conference with the members of the committee on employment and training. Adequate mechanical training and experience are required.

To insure obtaining the maximum amount of vital information, so that fair judgments may be arrived at, applicants by mail are asked to give complete information on a standard application form supplemented by a recent snapshot and a letter explaining more fully their training experience and desires.

Outline of Training

Mechanical training in shop comprises one to twelve months of productive time. Applicants, as accepted, are placed in the Factory Service Station as helpers or producers on regular production work and on regular production pay to the extent that they demonstrate their ability. They are usually placed first in the Chassis Repair division, and as they develop, showing ability, interest and the proper spirit for the work, they are pushed on through the various repair operations. When sufficiently qualified, they are transferred to the Motor Repair division, where a similar procedure is followed.

In this way experience is provided on all the important repair and fitting operations.

Toward the conclusion of the shop training those men who have shown that they possess the necessary mechanical ability, personal qualifications and right spirit toward the work, are selected for finishing training, consisting of driving, testing and trouble-shooting followed by such specializing training as may be necessary.

Service test, lasting from two to four weeks, is next given. This test is given to two to six men at a time and is available for the following groups:

(1) Men who have qualified in Productive Training Shop.

(2) Distributors' men, whose qualifications meet our requirements, when accommodations are available after taking care of regular men (1)

(3) Fleet owners' men, whose qualifications meet our requirements, when accommodations are available after taking care of regular and distributors' men, (1) and (2) above.

The work covers systematic testing, driving and trouble-shooting, as follows:

(1) Examination on mechanical work (mechanical, oral and written) as final check on mechanical qualifications.
(2) Study (disassembly and inspection) of carburetors, and electrical equipment (magnetos, distributors, switches, regulators, generators, starting motors) followed by examinations.
(3) Adjustment, tuning and testing of engines and trouble-shooting on test stand.
(4) Driving and road testing.

Final specializing training is given to such men as require it for the specific positions they seem best qualified to fill, by allowing them to act as helpers or assistants to the various men in the Factory Service Station Organization handling these specific duties; for example, prospective truck inspectors work with the local inspectors, foremen with the Service Station foremen, service salesmen with the Service Station car and truck service salesmen, service superintendent or managers with the truck inspectors, foremen, service salesmen and accountant.

To supplement the mechanical work in the shop, to afford a better basis for understanding it and to stimulate thought, study and personal development, two series of lectures are given, Shop Lectures and Service Training Lectures.

The shop lectures are open to all the men in the service station, attendance being required of those in training. Three courses are included:

(1) Construction and Operation of the Motor Car.
(2) Evolution of Design and Construction of P-A cars and trucks.
(3) Automotive Electrical Equipment—Fundamental electrical principles and applications, construction and operation.

The Service Training Lectures cover a discussion of Service Station problems, such as stock and tool keeping, repair order system, routing work, handling men, shop costs, truck inspection, etc. They are open only to the men in the finishing courses.

Progress of Men Closely Watched

The progress of the men is closely followed and checked by means of critical observation and periodic reports, conferences and examinations. Records are kept of these to assist in judging the fitness of the men and to assist the Committee on Employment and Training in the proper placing of the men when finished.

High morale, "spirit," is in large measure, the factor that determines more than any other the larger and permanent success or failure of an organization.

In our case, one purpose of service training is to infuse into the men as much as possible of a spirit of service; for the company, which is training them; for the agency or company employing them; for the customer whom he may serve.

This is partly a matter of morals and ethics and partly a matter of mutual understanding between and appreciation of men.

Means to this end, as provided by the training system, include:

1. An intimate knowledge of the factory and its product through visits to its various parts and observation of the nature and character of the work done, and the actual work done on the product as it passes through the men's own hands in the Service Station.

2. The personal attention given to each man through the various stages of his training by all the men concerned with training.

3. Personal contact and acquaintance with the Service Department personnel through interviews, conferences, lectures and occasional association in other activities.

4. Contact and acquaintance with important executive heads of the administrative personnel of the company through attendance at informal talks or get-togethers.

5. Informal get-togethers or service suppers to promote mutual acquaintance between the men and to afford contact with important factory and department executives.

6. Occasional picnics, games, etc.

Placing Men

The placing of men may be outlined as follows:

1. **Men Wanted or Required.**
   a. For distributors, men are requested or required
      (1) to supply men with factory training and acquaintance with the product.
      (2) To replace men leaving.
      (3) To fill new positions.
      (4) To establish entire new organizations.
   b. For Fleet Owners are requested:
      (1) All-round mechanics for maintenance repairs, testing, trouble-shooting and emergency service.
      (2) Truck repair master mechanics, foremen or superintendents.
   c. For Service Department men are occasionally needed for
      (1) District Service Representatives (Roadmen).
      (2) Office organization.
      (3) Factory Service Station.
   d. Types required include Head Testers, all-round Service men, foremen and truck inspectors, Service Salesmen, Superintendents and Managers, roadmen, technical men with service experience, etc.
2. **Men Available** include
   a. Men just completing factory service training.
   b. Factory trained men who, for legitimate reasons, desire to make a change or having left the organization, wish to return to it.
   c. Experienced distributors' men who, for legitimate reasons, desire to make a change or having left the organization, wish to return to it.
   d. Experienced non-P-A men.

The greatest difficulty in successfully meeting field requirements is to have the right men available at the critical time of need. The requests or needs for men in the field are usually irregular and unexpected as to type and time required and often epidemic. Sometimes the annual averages of men required can be fairly approximated, but the time element cannot be anticipated. This is further complicated by the fact, that, although the training shop affords a small reservoir with a little flexibility, good men are so scarce that they must be accepted for training usually very close to the time when they become available rather than at any arbitrary time set by the factory; and, furthermore, nothing positive is known as to their capabilities until toward the close of their training, which extends over a period upward of nine months and cannot be fixed absolutely. The same difficulty applies to outside men; they cannot remain out of work very long, neither can a distributor, as a rule, wait very long for a man.

To facilitate the proper handling of requests, as nearly complete records as possible are kept on file by the Field Organization Department relative to the field requirements and the qualifications of the men available.

In some cases placing of men is accomplished by placing employers and men available in direct communication with one another to make their own arrangements.

In most cases, however, the placing of men is closely guided by the Field Organization Department in order to place the best qualified men in the most strategic positions and in such a way as to constantly increase the number of service stations with factory trained men in charge and to build up the service in centers important and strategic from a sales standpoint. Both men and employers usually hold the factory largely responsible for the success of these arrangements. Therefore, in all such cases, it is clearly recognized that no such arrangement can be long successful unless it is agreeable and profitable to the man, to the employer and to the Pierce-Arrow Motor Car Co. For this reason most of this work is done by conference with the members of the Committee on Employment and Training, who combine their resources of knowledge and understanding (gained through correspondence, field trips and personal contact) of the company's field needs, the nature and disposition of the employer and his organization and their needs, and the nature and disposition and other qualifications of the men.

Some idea of the value of this training may be gathered from the fact that there are now in the field service organizations of our distributors somewhere in the neighborhood of 160 men who have had a thorough factory training and are familiar with our product and who are occupying positions of more or less responsibility from that of service manager down to that of all-round service men.

Not only is this a splendid asset to the company in maintaining Pierce-Arrow service standards in the field which has had a material influence on sales, but through the maintenance of the training work the company has been enabled to fill in a number of serious breaches in our field service organizations. For example, in January, 1919, when the Cincinnati agency changed hands from the Hanauer Automobile Company to the Cunningham-Holmes Company, it became necessary to build a sales and service organization from absolutely nothing, not even a building. With the aid of the department a building was selected and leased, plans for remodeling made and the work supervised, tool equipment ordered and its installation supervised, stock equipment recommended, ordered and placed in order in the stock room and a factory trained personnel installed in the service department, including service manager, shop foreman, truck inspector and head tester, so that a going concern was provided and established even before the building was completed. Similarly in Denver in 1919 when Mr. Arthur Kumpf took over the agency from Tom Botterill, in addition to assistance with his building layout, Mr. Kumpf was provided with a shop foreman, truck inspector and tester, and an all-round service man for Colorado Springs, so that he had a working organization almost from the outset. Such complete reorganizations are not always possible unless the proper calibre of men are available at the time of need, but such results as have been attained would have been all but impossible were it not for the facilities of the training shop and its small reservoir of carefully selected and trained men.

Pierce-Arrow Service Training inaugurated originally about 1906 as a chauffeurs' school, has been in operation now for about 14 years and out of this has evolved the system as outlined.

The following is a summary of the work done during 1918 and 1919:

	1918	1919
MEN ENTERED		
Regular	33	34
Special, from agent	9	5
From owner	1	.
New men	3	2
Old men returned	7	5
Total	53	46
MEN QUIT, DISCHARGED		
Regular	12	9
Special	1	—
Total	13	9
MEN PLACED		
By Department		
With agent	18	26
With owner	3	2
With factory departments	12	9
Returned to		
Agent	9	5
Owner	1	—
Total	43	42

From this it will be seen that the present average rate of output is about forty-two men per year.

At the present time there are some ninety-one places where recognized service is rendered by our distributors and of these fifty-two have in their service organizations one or more men with more or less Pierce-Arrow service training who are giving satisfactory service.

Freezing Points of Alcohol-Water Mixtures

THE Air Service, Engineering Division, McCook Field, has worked out a tabulation of freezing points and specific gravity of alcohol and water mixtures which are applicable to automobile as well as airplane practice. A number of tabulations have been gotten up by various individuals and curves printed showing freezing points. It has been noted that marked discrepancies can be found among these various tables and it is of value to have one which has the sanction of the McCook Field laboratory.

As a result of the examination of various anti-freeze solutions by the Air Service, it was found that alcohol-water mixture gave the best results, considering temperatures at which ice crystals would form in solution, running temperature for radiator mixture, ease with which solution can be prepared by the mechanics, and cost of materials involved for producing the mixture.

It should be remembered that mixtures of alcohol and water have a much lower boiling point than water alone. For this reason it is well to keep the water temperature below 167 deg. Fahr. where possible and never allow it to reach 176 deg. for any considerable length of time, as loss of alcohol will take place very rapidly. The following tabulation gives the freezing point of alcohol-water mixtures:

FREEZING POINTS OF ALCOHOL-WATER MIXTURES

Percentage of Alcohol by Volume	Temp. Deg. Cent.	Temp. Deg. Fahr.	Percentage of Alcohol by Volume	Temp. Deg. Cent.	Temp. Deg. Fahr.
0.0	0.0	+ 32.0	25.0	— 11.5	+ 11.3
2.5	— 2.0	+ 28.4	27.5	— 12.9	+ 8.8
5.0	— 2.8	+ 27.0	30.0	— 14.8	+ 5.4
7.5	— 3.2	+ 26.2	32.5	— 16.0	+ 3.2
10.0	— 4.0	+ 24.8	35.0	— 18.3	— 0.9
12.5	— 4.7	+ 23.6	37.5	— 20.0	— 4.0
15.0	— 6.0	+ 21.2	40.0	— 22.1	— 7.8
17.5	— 7.1	+ 19.2	42.5	— 24.0	— 11.2
20.0	— 8.5	+ 16.7	45.0	— 26.9	— 16.4
22.5	— 9.5	+ 14.9	47.5	— 28.8	— 19.8
			50.0	— 31.1	— 24.0

Preventing and Controlling Factory Fires

There are two major phases of factory fire prevention. The one concerns the use of fire resistive materials in the construction of buildings; the other relates to elimination of potential fire centers of one kind and another through the plant. This article discusses both factors.

By C. A. Briggs

SOME thirty or forty years ago when fire resistive buildings of the steel beam type were first erected fear was expressed by some officials of insurance companies that if this new type of "fireproof" building were to become popular, insurance against fire would soon be unnecessary. Since that time there have been innumerable instances of the fallacy of this idea. The fact is often overlooked that while the building itself may be of fire resistive material, there are few buildings which do not contain a sufficient quantity of combustible material to cause a considerable fire.

Some persons, however, still indulge in this false feeling of security, taking it for granted that their lives and goods are safe in what we term to-day fire resistive buildings. But this is not the case. Take as an example the destruction by fire of the Vanderbilt Addition to the Fine Arts Building in New York, with the loss of many priceless paintings, sculptures and other irreplaceable art treasures. This fire occurring the day before the opening of the thirty-fifth annual exhibition of the Architectural League caused architects throughout the country to sustain an almost personal loss.

FACTS ABOUT FACTORY FIRES

A CLEAN factory seldom burns.
Fire loss is not limited to fire damage.
All fires are preventable, except those due to arson, lightning, and explosion.
It is not only what a building is made of that counts, but also what it is filled with.
All fires begin as small fires.
America's annual fire loss is more than $250,000,000.

While these things are distressing, there is reason for hope if through this awakening architects will have brought their professional training and research to bear upon the fallacy of what we used to term "fire proof" buildings. We have learned long since to say "fire resistive," but there are degrees that must be recognized even in the use of this term. Many architects, however, now feel very keenly their responsibility as regards the material they specify in buildings that from the nature of their use should be as far as possible proof against fire. The replies from a questionnaire sent out to a number of architects of schools, hospitals and asylums, however, seem to indicate that any approach to fire resistive or slow burning construction is accepted by some as "fire proof" and that no provision is made for the material that might be housed in these structures.

Regardless of the character of construction, any building that has or may have combustible contents, should have ample provision made for fire protection, usually some standard type of sprinkler system. This conclusion is based upon an exhaustive study, by the National Board of Fire Underwriters, of recent fires in buildings that were supposed to be non-hazardous.

It has been stated before the Structural Engineers Society of Pennsylvania that there is in the ordinary office building 100 ft. wide and 100 ft. deep, twelve stories high, enough fixed combustible material to run the Mauretania 24 hours, which in that time burns 1200 to 1300 tons of coal.

In an excellent article entitled "Steel Furniture and Trim," C. E. Worthington discusses the great value of steel furniture and metal trimmings, which unfortunately have reached a price that makes their general use almost prohibitive. Experiments have proved that steel desks, filing cases, metal waste baskets and other metal office equipment have a high preventive quality. A few years ago metal window frames, sash and casings could be had for very near the cost of wood, and it is to be hoped that this condition will not be long in returning.

The National Fire Protection Association says in one of their recent bulletins, "We must come eventually to the equipment of all commercial, factory and office buildings with metal window frames and wired glass. This will mean the abolition of the conflagration hazard in our cities. Fires will then be unit fires, extinguished easily by a competent fire department within the building in which they originate, for the protection of window openings not only prevents fire from entering but prevents fire from issuing out of the burning building. We may expect an occasional exceedingly hot fire to break down the defense of an adjoining building, but it is obvious that a conflagration could not get under way with fire resistive construction with properly protected window openings."

While emphasis is laid heavily upon metal window frames and wired glass, there are other openings in the side walls to be considered. These include such things as ventilators, unused exhaust vent openings or drips. We recently read of the complete gutting of a building that was equipped fully with metal window frames, shutters, etc., because the flames shot through an opening the size of a man's hand from an adjacent burning building.

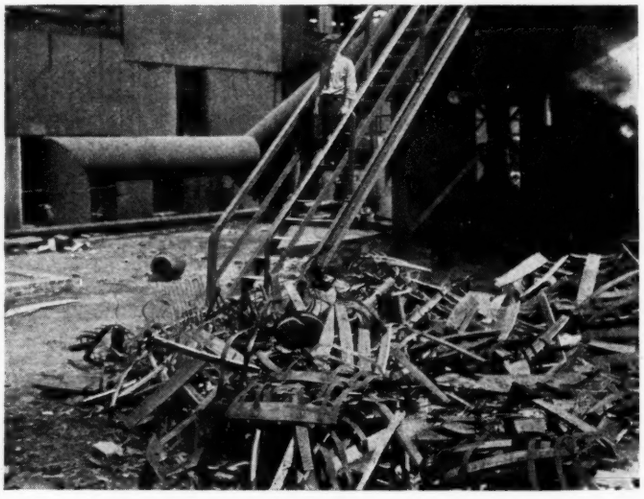
Whatever the resistive quality of the building, rein-

forcement, consisting of adequate fire fighting apparatus must be provided.

But building material is only one phase of fire protection work. The other important factor relates to those numerous bits of negligence which are usually the cause of fires. The present attitude of public opinion regarding the liability of fires from easily avoidable causes is taking a definite trend. Already the cities of New York, Cleveland and the State of Pennsylvania have laws which provide that any person, firm or corporation on whose premises fire originates because of negligence or failure to comply with any law or ordinance shall pay to the city the full value of the services of the fire department and any damage in person or property resulting thereto in extinguishing or attempting to extinguish such fire. These laws are forerunners of what may be expected in many cities and states in the near future. In other words, the American people are to be made to recognize their responsibility for the elimination of fire causes and the prevention of these enormous unnecessary losses.

The National Board of Fire Underwriters recently announced that property worth $1,416,375,000 was destroyed by fire in the period from 1915 to 1919 as revealed in the quinquennial analysis of 3,500,000 adjustments made by the Fire Underwriters during this five-year period. This loss is the equivalent of 283,275 houses at $5,000 each, or more than enough to shelter the total population of a state the size of Connecticut.

Electricity was given as the chief cause of fire loss with a total for the five years of $84,086,471. Matches and smoking was found to be second with $73,474,348 and defective chimneys came next with $56,650,915. Other causes in their order were: stoves, furnaces, boilers and their pipes, $55,133,181; spontaneous combustion, $49,702,886; lightning, $39,828,489; sparks on roofs, $29,271,585, and petroleum and its products, $25,910,434. Incendiarism contributed $21,596,965 to the damage, and miscellaneous unknown causes completed the total.



A commonly overlooked fire hazard. Accumulation of rubbish which may easily contain nucleus for a serious fire. In this case it is also a tripping hazard to employees using the stairway

By far the greatest proportion of this immense fire loss occurs in industrial and manufacturing property and it would seem that the prevention of fire destruction is not progressing in the same way that other life and property protective measures are doing. If fire hazards were attacked with the same enthusiasm and in the same systematic manner which is now being observed in accident prevention, sanitation, welfare and housing problems, a more favorable report from year to year would appear instead of a steadily upward trend in fire losses. In 1918, moreover, there were 15,000 lives lost in flames in this country.

The illustrations used herein of fire hazards are not exceptional and they doubtless could be duplicated in hundreds of instances.

The automobile industry has definite fire dangers. Every manufacturing establishment has its own peculiar fire hazard. The lumber business, the paint and varnish industry, enameling plants and garages, for instance, all have what might be termed a distinct fire hazard. And the automobile industry in its highly organized state, has in some form, all these fire dangers with which to contend. This makes it advisable, if not imperative, that insofar as possible fire resistive buildings be used and that effective equipment be kept in readiness to fight the fires which are apt to break out where paints, varnish, gasoline and other volatile liquids are handled.

Under these conditions, too, a fine bit of discrimination must be exercised when the flames are approached. If it be an enameling vat or an oil tank that has caught fire, for example, it should not be attacked with a line of hose from a water hydrant. There is also an element of danger in training a stream of water on a blazing motor.

There are certain kinds of chemical extinguishers on the market that must be used with discrimination if they are to be effective. The essential thing is to select equipment suited to the existing hazards, keep the equipment in good condition, in the right place, and under the care of men who are apt to use good judgment in an emergency.

The selection of fire extinguishers is a very important factor and the judgment of experts should be followed. The claims of various concerns manufacturing this material cannot always be relied upon and it is wise to call for aid upon such agencies as the Underwriters Laboratories, Chicago, or the Factory Mutual Laboratories, Boston, either of which can give expert advice as to the proper equipment suited to your case. The selection of fire hose is especially difficult, since it is practically impossible to distinguish between good rubber lined hose and bad, when it is new. Hose bearing the Underwriter's label can always be relied upon as having passed the test required.

The Safe Practices pamphlets which are issued by the National Safety Council, Chicago, contain excellent advice and guidance on practically every phase of the fire problem and they should be consulted for a more detailed study of this subject.

With the help of such concerns within range no manufacturer should find himself unprepared should fire visit his premises. However commendable it may be to prepare to stop fires after they have started, it is vastly more commendable, though less spectacular, to be able also to say, " 'My house is in order,' go where you will, in the unfrequented corners of the basement, in the storage loft, look under benches, in dark corners and cupboards and you will not find me negligent. I have removed the evidence and as far as humanly possible I will not be guilty of contributing to the 'national ash pile.' "

A GERMAN syndicate has made an offer to the Brazilian Government to establish automobile, balloon, and agricultural implement factories in the State of Minas Gereas, according to a cablegram to the British Foreign Office from the Brazilian consul in Berlin. Special concessions in duties and freight rates are requested.

Norway Bars Passenger Car Imports

Destruction of roads not built for automobile traffic and depreciation of krone laid to large importations of motor cars. Motor traffic, which is considered a luxury, subjected to rigid regulations. Maximum weight of truck and load is 5 tons. Pneumatics or larger solid tires required.

A. L. FIELD, American representative of Sigurd Gran Rishovd of Christiania, Norway, writes:

"The large importation of motor cars into Norway during the last two years is usually blamed for the falling of the Norwegian krone to about half of its normal value in international exchange.

"The increased use of motor cars and motor trucks on Norwegian roads, which were built for light traffic only, has damaged them so seriously that all the main roads, even those built in the last two years, will have to be entirely reconstructed.

"Motor traffic is considered merely a luxury here, and this, together with old traffic regulations, has discredited the automotive industry with the authorities.

"In an endeavor to improve the exchange, the Norwegian Government has taken the drastic action of restricting the importation of everything they consider a luxury, and the first thing singled out was the passenger car. Norwegian dealers in passenger cars were not permitted to import more cars than they had in transit and paid for, before and on the first of August last. No more passenger cars will be permitted to enter Norway before the rate of exchange has improved considerably.

"Owing to the enormous expense of rebuilding the Norwegian roads, the authorities have found it necessary to regulate traffic to suit the roads instead of building the roads to carry the increased traffic.

"This was done by drawing up new regulations for motor trucks, the Government Road Commissioner being appointed the chairman of committee designated to draw up the necessary regulations. Under them, motor trucks of 1¾ tons load capacity, and less, are not permitted on the roads unless they are equipped with pneumatic tires. The committee, not satisfied with the standard size tires used on American trucks, decided that tires from 1 to 2 in. greater than the standard size would have to be placed on American trucks if they were to be used on the Norwegian roads.

"It is also specified in the regulations that the weight of the truck and the load together must not exceed 5 tons. This practically limits the trucks to 2½ ton sizes or less.

"The accompanying chart is the result of the efforts of the committee appointed to draw up the new regulations for motor trucks."

AN exhibition of agricultural machinery and a series of motor tractor trials are to take place at Lerida, in Spain, from April 1st to 10th next. All kinds of agricultural machinery will be admitted, including machinery used in the derived industries. Manufacturers of fuels, lubricants and all accessories used in connection with agricultural machinery will also be allowed to exhibit. The address of the Organizing Commission is, Urgel, 197, Barcelona.

Norwegian Regulations Regarding Tire Sizes

Effective Jan. 1, 1921

Unless special permission is granted by the Road Commissioner, motor cars are not allowed on country roads with tires below the sizes specified herewith.

Front Wheel					Rear Wheel					
Weight on axle at full load, lb.	Pneumatics		Solids		Weight on axle at full load, lb.	Pneumatic		Solids		The stated axle loads correspond to the following load capacities in tons.
	Inch	mm.	Inch	mm.		Inch	mm.	Inch	mm.	
					2420	Single 4½	Single 120	Not permitted	Not permitted	
1540	4½	120	Not permitted	Not permitted	3080	Single 5 Dual 4½	Single 135 Dual 120	Not permitted	Not permitted	1
1980	4½	120	Not permitted	Not permitted	3740	Single 6 Dual 4½	Single 150 Dual 120	Not permitted	Not permitted	1¼
2200	5	135	Not permitted	Not permitted	4400	Single 7 Dual 5	Dual 135	Not permitted	Not permitted	1½
2640	5	135	Not permitted	Not permitted	5280	Single 7 Dual 5	Dual 135	Not permitted	Not permitted	1¾
2960	6	150	5	120	5940	Single 8 Dual 6	Dual 150	Dual 5	Dual 120	2
3300	6	150	5	120	6600	Single 9 (10) Dual 6	Dual 150	Single 8 Dual 5	Dual 120	2¼
3740	6	150	5	120	7260	Single 10 Dual 6	Dual 150	Single 8 Dual 5	Dual 120	2½
4180	7	(175)	6	140	7920	Single 10 Dual 6	Dual 150	Single 10 Dual 5	Dual 120	2¾
4400	7	(175)	6	140	8800	Single 10 Dual 6	Dual 150	Single 10 Dual 5	Dual 120	3
4840	7	(175)	6	140	9680	Single 12 Dual 6	Dual 150	Single 11 (12) Dual 6	Dual 140	3¼
5280	8	(200)	6	140	10560	Single 12 Dual 7	Dual 175	Single 12 Dual 6	Dual 140	3½
5940	8	(200)	7	160	11880	Single 12 Dual 7	Dual 175	Single 12 Dual 6	Dual 140	4

Hub Standardization

Editor AUTOMOTIVE INDUSTRIES:

This question of Hub Standardization has been given by me much thought and leaves me in a somewhat peculiar position which I think it well to place before the industry through your magazine so that the subject can be ventilated.

From the point of view of the manufacturer, interested in quantity production at a low price, there is no question but that a large measure of standardization should be adopted and put into effect. I feel that the standards at present before discussion will save expense in the manufacture of roller bearings; they may save some slight expense in the manufacture of hubs, and they will certainly save some expense in the manufacture of wheels. At any rate, from the manufacturing standpoint, the existence of standardized hubs will eliminate many troubles which arise and will have an effect of rendering our inventories more liquid and by the reduction of cost may, perhaps, have an effect on the actual merchandising.

The above is a selfish view, based solely on my own desires as a manufacturer. At the same time, however, there is a lurking suspicion in the back of my mind that such standardization may lead eventually to loss of individuality. This is a question which has not yet, however, come up seriously, though looming in the background, and thinking again, as a manufacturer, of the immediate dollar, I am inclined to dismiss it.

It is, however, in my other capacity as an engineer, thinking more in terms of the industry as a whole than of one particular section of it, that I am inclined to question the desirability, or even advisability, of this at this time. I feel that as an engineer, and a member of the S. A. E., I should be asked to take a much broader view of the whole industry rather than a more intimate, selfish view of a small portion of it, namely, wheel makers and makers of axles for sale to assemblers. I feel that if this step be taken that it must, perforce, lead to other steps being taken, with an ultimate deadening of initiative in many other important parts of the car or truck.

Please take the existing standards that surround the front axle, lay out those proposed on a sheet of paper, lay out the center lines for the spring pads, which are practically standardized by virtue of the standardization of the width of the frame, lay out the felloe bands and tires with their position relative to the center of the axle, all of which has been standardized, and you will be surprised to find how little remains to be standardized on the front axle. It is all very well to state that each of these has been standardized irrespective of the other, but if you standardize a series of points, Euclid's law that a straight line is the shortest distance between two points, naturally brings about a standardization of the connections. Therefore, with these points standardized, it is a most elementary proposition to sketch in the balance and have a standardized front axle. There remain, virtually, only the yoke on the steering spindle and the depth of the spring pad from the steering spindle; standard clevises for the steering tie rod practically complete the picture.

The front axle is practically the first thing one sees in the truck or car. Study the advertisements of a number of makes and you will often see them surmounting a hill, evidently showing great power or great speed, with the front axle very prominently displayed. Is it a wise thing to reduce all axles to the same dead level of size and shape? A friend of mine, who has just returned from England, was driving a prominent American car over there and states he was asked repeatedly was his car one or other of a number of makes, and was told that it was very difficult to distinguish American cars because they all look so much alike.

It seems to me that any step that tends to a leveling of design is greatly to be deplored and should be considered very long and very fully before being adopted. In this connection, I would like to add that the time interval between the initiation of this proposed standardization, approximately June, 1920, and the time it was brought up for approval, January, 1921, is altogether too short. It savors too much of politics rather than the mature deliberation of an engineering body.

Again, I confess to a feeling that such a sweeping standardization, which will bring about increased production, must necessarily standardize on the basis of the weakest link in the chain. For example, it is stated in the report that the spindle is of such size that even 1035 steel can be used for emergencies. Nobody in their sane senses would dream of using 1035 steel on the truck front spindle, subjected to such heavy work as it has to withstand, but necessarily a proposed standard must take in a poor quality of steel.

Next in order come the bearings. Here again, the different bearings which are made in quantities have to be considered, and the one of the lowest load carrying capacity, with a reasonably large production, is the one on which the standardization must be based, thus penalizing the much higher grade bearing which, for the same space occupied, has a much higher load carrying capacity. The standardization of bearings by size, rather than capacity, has the effect of lessening the attempts to put in increased value, either of material or workmanship, into a given size. It is then up to the salesman for the bearing to base his selling argument entirely on a question of life, and no other point. He cannot preach economy because by the use of the higher priced bearing, being smaller in size, he is able to save in other materials. This is a point which might be argued on by reason of the fact that a large number of producers want two sources of supply and unconsciously set up a standard in themselves based on the lower quality bearing. This is true for production purposes, but is not true when one considers the best design.

I have a feeling that this bearing standardization by size for certain types of hubs, is actually based on the fact that there has been a failure to standardize sizes of roller bearings in the same logical sequence as exists in ball bearings. Because of this failure to do the thing properly, we are compelled to do this improperly, with possibly detrimental results at a later date to a true standardized logical series of roller bearings.

I am willing to concede, however, that a standardization of taper roller bearings over a limited number of hubs will

bring about more economical results for the manufacturer in the long run. These sizes can be made up in larger quantities and be carried on the shelf with a certainty of disposal, and will tend in many ways to stabilize employment in each factory. It is a truism that the factory having the largest number of customers for a particular object is in the best shape to weather any of the usual industrial depressions and is also in the best shape to stabilize seasonable variations in manufacture.

When it comes to hub standardization, I find myself in grave doubt as to how far this should go. I cannot see that it effects any saving whatsoever. On the contrary, I can see nothing but new expense for dies, for patterns and tools, and an addition to the existing types by a new type. As an engineer, interested in the broad aspects of economy, I would rather have seen the committee pick out a number of existing hubs and standardize on them rather than adopt a completely new line. I feel that if a standard dust washer and standard locking nut are included that it is only a little step more to standardize the complete hub, including the hub cap attachment. Personally, I would, however, rather not see a standardization of these two small parts, not because I feel that the proposed idea is not good and that I know of something better, but simply because on the part of one of them, namely, the dust washer, I feel that we have not reached a final satisfactory design. On the locking device, some factories are tooling up to make one type better than any other and this should be left to stand.

All of the above leads me to a feeling that there is coming a parting of the ways in the S. A. E., for engineers who are concerned with the manufacture of specialized products, or for engineers who are concerned with the industry as a whole. I have not the slightest objection to such standardizations as outlined above, in fact I am in favor of them provided it is distinctly understood that they are for a localized or specialized group of manufacturers. I do feel, however, very strongly that they should not be made a part of the national Society dealing with engineering affairs in a broad way, as such standards are not, and cannot be, true standards in every sense of the word. I would venture to suggest that some other word be adopted to signify such standards as a distinction from what might be called "national" or "fundamental" standards. I do not like the word "standards" at all in this connection; "recommended practices" is slightly better, but again it does not express the facts. For example, how can one say this is a "standard" or even a "recommended practice," when the White Motor Co., admittedly one of the finest truck builders in the country, has a hub totally different from that proposed, and further will in all probability never adopt the one proposed. Similarly, with some other manufacturers who could be named, their probability of adopting the proposed standard is almost nil.

As I said, I do not know what this name should be and have little suggestion to offer. There should be some very strong distinction, and further voting on such proposals should be limited strictly to the groups that will benefit by this work and should not be opened broadcast to the Society. I would suggest, Mr. Editor, that you open up the columns to a discussion on this and to a suggestion of how best this shall be handled. Perhaps a suggestion like this—"axle manufacturers' standard practice," or "wheel makers' approved practice"—might be adopted.

Last on this subject, I would like to add a few words more, although I already feel I have taken up a lot of your space. Many of these standards, or recommended practices, are adopted for the sake of saving the designer some time and allowing him to think of higher things. It is admitted that the most valuable part of this work lies in the committee meetings where the members discuss their own practice very intimately and with great benefit all around. Might I suggest that the S. A. E. gather together many of these engineering practices, just as Professor Unwin used to do in his textbook on Engineering Design, and submit them as part of the work of the Society for consideration. This would lead to a much more intelligent action when the time came for approving the particular practice.

For example, take the case of this hub standardization. It would be in order to have the Society print drawings showing typical Timken hubs, another with typical Eaton hubs; similarly, typical practices of the White company, the Pierce-Arrow company, Packard company, Riker company, etc., could be embodied and these practices would be a distinct guide to a draftsman or designer in arriving at his own conclusions. There is no use disguising the fact that every one of us, when redesigning some part of his car or truck, takes out his yardstick and goes down and measures the other fellow's work. The S. A. E. would be doing a wonderful thing in collecting a lot of this information, publishing it, and eventually, providing the tendency were shown, they could collect this, boil it down, and adopt an approved practice. This practice should be based on what is best, and not on what is average. As I have pointed out several times, the average is just as near to the bad as it is far from the good.

An afterthought occurs to me. Why should not the hub cap be standardized inasmuch as this would lead to a considerable economy in manufacture by the hub odometer people? Please note in asking this question I am not suggesting it is advisable to do it, or desirable, but am simply asking a question that seems to be just as logical as others.

JOHN YOUNGER.

THAT certain kinds of research work having to do with specialized industry cannot be carried out advantageously at universities, but should be entrusted to the research associations which are able to concentrate on particular problems is the contention of F. W. Burstall, Professor of Mechanical Engineering at Birmingham University. At this university the study of the internal combustion engine is being attempted on lines somewhat different from those which have been in vogue previously. Professor Burstall wants to obtain results as to the behavior of internal combustion engines which shall be independent of any particular type of engine or kind of fuel. For this purpose he has constructed an engine in what he terms a theoretic form to show all the changes of temperature which take place in the working fluid.

A small motorcycle used in Switzerland. The weight is said to be but 32 lb., the speed 15 m.p.h.

Number of Working Hours as Related to Production Cost and Rate

The factor of mental fatigue enters into the question of working hours as well as that of physical fatigue. The relation of working hours to unit production costs was brought out in a letter from an automotive manufacturer, which is quoted and discussed here by Mr. Tipper.

By Harry Tipper

FROM one of the subscribers of AUTOMOTIVE INDUSTRIES I have received a letter concerning the relation between hours, production efficiency and fatigue which is of unusual interest, and for this reason I am quoting liberally from the letter as follows:

In one of the plants employing approximately 3000, working hours were reduced from ten to nine, piece work prices remaining the same per piece, under the new schedule as obtained before and hourly rates increased the necessary percentage so that a man's labor for nine hours paid him the same as had been paid for ten previously. The actual net result of this move was to slightly decrease actual cost of production per unit.

In the other plant, employing approximately 600 men, time was reduced from ten and one-half to nine and one-half hours per day. There was practically no piece work in existence. Hourly rates were increased so that a man's earning capacity in nine and one-half hours at least equalled and in some instances, so as to avoid splitting a cent for an hour, a man's earnings were better in nine and one-half than had previously been obtained in ten and one-half. And in comparing the costs per unit of production between 1916 and 1919, during which time the original hourly average rate had been increased about 75 per cent, the actual cost of production per unit in 1919 was about one-half of 1 per cent less than in 1916.

The move, of course, was not made with the primary idea of reducing costs below the pre-war costs, but the move was made, however, on account of knowledge gained in the former experiment with 3000 men and it worked out to extremely good advantage with the crew of 600.

This company is not reducing hourly rates. We are, however, shading selling prices and it is being done by slight reductions in costs of both material and labor. The labor reduction is being accomplished by letting the individuals who actually do the work, realize the fact that the management of this institution does not pretend to believe that the mentality or brains of the institution are contained in one particular cranium.

Apropos to the long hours, fatigue, etc., I have had during the past eight or ten years a good many conversations with rather high class employees, although they were plain workmen, not officials in any capacity, of some of the big, high speed, intensively advertised manufacturing plants and it seemed safe to conclude from these conversations that absolutely the only reason why men stayed with them was because of the money that there was in it. They confessed though, that at the speed at which they were driven and at the hours that they were forced to put in, they dreaded daily, going to the place, as virtually they were more tired on arrival at the shop in the morning than they were after they got into action. Furthermore, these particular men seemed to find it necessary to take time off semi-occasionally to recuperate.

These instances are not unusual in their indication that the number of hours worked does not have a very close relation to the production rate and that the operation of a ten-hour day may not be economical even though the pay is based upon a day's labor and not upon an hourly payment.

There are many other instances where the reduction in the working period has led to an increase in the efficiency, so that the earnings of the worker could be maintained or even enlarged while the labor cost per unit has decreased.

The question of hours is necessarily bound up with the question of fatigue and the last paragraph of the quotation is interesting because it affords the reason for the effect secured in the instances indicated in the earlier paragraphs. High speed, concentrated work on repetitive operations is fatiguing in the extreme and the effect of the repetition of similar motions on the nerves and muscles has been known for a considerable time to the medical profession. Not so much is known of the mental fatigue which results from this type of work, and the effect which that mental fatigue has upon the actual physical condition.

It is not economically sound to arrange the working periods so that there is an accumulated fatigue which cannot be overcome in the periods of relaxation. Not only is this the case, but the effect of the fatigue from concentrated work is to demand a type of relaxation that is not really a relaxation at all, but simply changes the character of the mental pressure.

The strained concentrated character of the repetitive work in the needle trades, directly demands the activity of the dance, the emotion of the melodrama and the mental stimulation of sentimental excitement as a relief from the narrow concentration of its efforts. In a much more definite form it demands the relief which induces the schoolboy (on his release from the class room) to indulge in fight, noise and all the physical activity which he can secure. In the older persons the demand is more sophisticated and relieves itself through the channels which I have mentioned.

At the first glance this sounds as though it had very little to do with the working efficiency, but the accumulated fatigue results in the establishment of a minimum pace that is only increased under pressure of economic fear. It results also in a degeneration which was definitely observed by medical students in Great Britain before the war, and which lead to a complete revision of the army tests in that country.

Unforunately, the knowledge which we have gathered medically has not been applied industrially so that we could determine the most economic period for the working hour under various conditions of operation. We are still misled into thinking that because a man works ten hours, he does more than he could in nine hours.

We are still under the impression that the hour's work is subject to a definite limitation, and that we lose the production effect because the working period is shortened. This persists, despite the fact that many careful observations have been made, indicating the production curve average under different conditions and drawing some conclusions from these examinations as to the relation between production, fatigue and work. These observations, however, did not go far enough, as they do not take into account the part which is played by the mental fatigue arising out of the destruction of the incentive and the elimination of interest in the work. These factors affect the production capacity to a great degree and they influence the accumulation of fatigue to an extent which has not been admitted.

This question has no relation to the demand of the labor union for shorter hours, and it is not affected in the least by the circumstances of that demand. It is a matter of arriving at the working period which will produce a maximum production and therefore the minimum cost per unit produced.

It calls for a consideration of labor cost in its definite relation to the production effect, and it requires a careful study of the work, the concentration and repetition demanded by the work, the reaction upon the man and the fatigue induced by the continuance of that reaction over a definite period. It is an intensely practical way in which to study the human relations in the plant with the possibility of a great practical benefit on both sides.

This is the kind of study which must be given to the human question if we are to be thoroughly informed thereon and thoroughly efficient in our consideration of it.

There is no possibility at the present time of determining with reasonable accuracy the working period which is of the greatest advantage in connection with definite lines of work or definite industrial occupations.

We operate blindly on eight, nine, ten or twelve hours, according to custom and tradition, and without any knowledge of the advantage or disadvantage accruing from this method. As a rule, we are not even patient with the man who desires to investigate such matters and are inclined to dub him impractical, or suspect him of sympathy with the workers to the detriment of the employer.

Sooner or later, however, we shall be forced to consider the question and to consider it with proper investigation and study. It will pay us to consider it, because we can only work at the greatest production efficiency when the worker is operating with the least fatigue and with the quickest recuperation.

Opportunities for Dealers Visualized in Exhibit

SOMETHING unique in the line of factory sales extension effort was introduced by the Nordyke & Marmon Co. during the New York show and is scheduled to become an important feature of the Marmon exhibits in several of the season's larger shows.

It is known as the "Dealer Opportunities Exhibit" and is designed primarily to attract the attention of desirable dealers and sell them the Marmon idea. The exhibit comprises a series of screens upon which are mounted specimens of the various sales extension activities of the factory sales organization and presenting a detailed outline of what the factory is doing to assist its dealers in merchandising its products.

While it is expected that the exhibit will interest many dealers and influence them in the desirability of the Marmon contract and its promise of real merchandising assistance, it is not the plan of the Nordyke & Marmon sales department to depend entirely upon the exhibit to make the contact with these individual dealers at the shows. The exhibit is, rather, a closing room, where dealers that are desirable through territorial location or for other reasons, may be brought by Marmon distibuters for a detailed exposition of the Marmon merchandising plan—where the closing effort in the sale of a Marmon dealer contract is made.

Within a few days after the exhibit was opened in New York factory representatives in attendance noted not only the fact that it was selling Marmon to the dealers who were casual visitors, but it was selling existing Marmon dealers on the advantages of their contracts.

The exhibit shows how the factory sales organization is prepared to assist in the merchandise of Nordyke & Marmon products through its advertising, sales letter, sales and service instruction, territorial analization and other activities in the interest of its dealers.

To some of the Marmon dealers it proved a revelation for, while they were more or less familiar with the things the factory was doing toward sales stimulation, many of them realized for the first time that they were not availing themselves fully of the opportunities that were within their reach and they left strongly sold.

One of the features of the exhibit that was particularly interesting to visiting dealers was the Marmon plan of territorial analization. In this section maps showing graphically the distribution of population, property valuations, car registration, wealth distribution and road conditions in specific dealer territories were shown. The factory sales extension department is preparing to extend this service to all of its dealers on request.

AN Alloys Research Association is being formed with an Alloys Information Service as the first step. This is to be co-operative on the part of those interested in metals and their alloys. An advisory committee, composed of 17 prominent technical men, was formed some time ago and this committee has evolved a plan, in conference with the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, whereby a service of a different scope from any now existing can be carried on for the benefit of the alloy men. The Research Extension Division of the National Research Council, Washington, D. C., which is aiding in the organization, will be glad to supply fuller details about this service.

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Better Brakes Needed

BRITISH and other critics of American cars say with more or less justice that the design and construction of the brakes fitted on our cars do not compare favorably with the practice common abroad or even with the practice with respect to other parts of our cars. This criticism does not, of course, apply to all American cars, but it is true in general that careless design and faulty workmanship is more common in connection with brakes than with any other important part of the car.

Brake drums frequently run out of true, and the band brake so frequently used on the rear wheels almost never bears evenly and usually drags at one or more points. It is true, as one of our correspondents has pointed out, that the band brake is easily adjusted, and can be readily taken off and relined without removing the wheel, but these aside from light weight seem to be about the only points in its favor, at least so far as its use on the rear wheel drums is concerned. On the other hand, it catches dirt, frequently squeaks or rattles and is, in short, too unmechanical to find a place on a well-designed car.

More study of brake lining materials should result in some betterment in construction, and methods of testing linings now being investigated at the Bureau of Standards should be helpful in this direction. There is much to be said also in favor of the use of transmission brakes, and, on the higher grade cars, of front wheel brakes.

Beyond question there is much room for improvement in braking systems as applied to the average American car. The subject is deserving of more study, and should not be overlooked at this time when the wise and progressive car manufacturer is seizing every opportunity to improve his product.

A Basis for Tax Revision

IT is curious that frequently some person will reduce a seemingly complicated problem to a primary analysis and will be hailed as accomplishing a great work. A recent example of this sort of reasoning and its effect is the Federal tax platform as issued by the National Automobile Chamber of Commerce.

It occurred to some one on the N. A. C. C. tax committee that the drafting and application of a tax program was a technical problem and that the average automotive manufacturer had no more reason for attempting to solve it than he would of going into his engineering department and laying down the details of the design of a vehicle he proposed to manufacture. Rather the manufacturer and the board of directors would generally outline the vehicle, provide the funds to employ the proper technical staff and say to the chief engineer, "We want results."

This theory was applied to the tax situation. The men on this tax committee reverted to the almost forgotten theory of democratic government that it is "of the people, by the people, for the people." In other words, the people should and must inform the technicians in charge of governmental work how much they shall have to spend on this work, just as the stockholders, speaking through the directors, tell the factory administrators how much money they can have for the coming period of activity.

As a part of this platform, the N. A. C. C. declaration holds that this generation, which has borne the direct injury of the war, should not be required to pay the entire bill of costs—that this cost should be refunded to spread the cost over at least two generations. This is the first proposal tending toward a decision as to how much should be levied in taxation.

As a second proposition, it is suggested that an analysis of governmental appropriations be made with a view of finding where economy can best be made. It is taken as a truth that the new administration is quite willing to carry into effect its pledges for a business and economical administration. Then it remains only for the people, through their spokesmen, to point out wherein they want economy enforced. It is believed that it is reasonable that representatives of business and civic and industrial organizations can speak for the people.

This platform of the N. A. C. C. has been widely distributed and the committee is receiving many let-

ters of praise, a number of which employ superlatives in recommending this plan.

The plan, as printed, points out forcibly that class taxes are objected too, that especially is it the view that excessive profit and surtaxes are not considered wise. Also that a sales tax does not seem desirable. But these points are not the major ones. The committee will submit that IF a sales tax is necessary, and that IF other objectionable taxes are necessary, that the method of employing them for the raising of the necessary money for the government should be decided by tax experts with a view of even justice.

It is interesting to note that the N. A. C. C. has not asked any association or person to adopt its tax platform, but that the committee has only asked if the principles set forth are common. It is much preferred that other associations use the principles in their own way. The committee has learned that it is not entirely a pioneer in this method of attacking the problem. A similar tax plan was drafted some weeks ago by the Rubber Association of America, but was not given publicity.

There is evidence that, with the technicalities dropped, there will be a nearer approach to agreement on a common tax platform.

Unemployment Responsibility

THE problem of unemployment, though never so acute in this country as in England, is important enough to merit serious consideration. A fundamental question for discussion in this regard is that of responsibility. Does the world owe a living to every man able and willing to work? If so, upon what group or agencies rests the responsibility for providing profitable employment or at least subsistence in times of unemployment?

In England the government, the trade unions and a few employers are assuming a part of that responsibility. There it is a matter of pressing need; some action is necessary immediately, whether fundamental lines of action have been determined or not. The article by C. H. Northcott in a recent issue of AUTOMOTIVE INDUSTRIES discusses the British situation.

Under an industrial organization such as we have to-day with the power of employment and unemployment in the hands of employers, it would seem that a considerable part of the responsibility must rest upon that group. Industrial depressions which take away from many men the opportunity to earn a living are, in a certain sense, an indictment of our industrial organization.

Even in this country conditions become so acute as regards unemployment at times that some immediate remedial measures are necessary. As Henry S. Dennison remarked recently in connection with the unemployment benefit plan being worked out at his plant, "There is a very definite need present right now; something needs to be done. It doesn't do to be too academic about the proposition at such a time. We are trying to work out a practical scheme at our plant to meet present conditions. We think we are on the right track."

And in the meantime, this question of the final resting place of social responsibility under our present industrial system should be carefully thought about by every industrial executive. Some general agreement having been arrived at on this score, the next step involves practical means for putting into action the principles conceived.

Fuel Economy Comparisons

WHAT low fuel economy we are getting in kerosene burning tractors is well brought out by the results of the Nebraska tests circulated at the Columbus show. In stationary gasoline engine practice it has long been the rule to figure on a consumption of one gallon per 10-hour day per horsepower, which is equivalent to 10 horsepower hours per gallon. Considerably better results are possible under specially favorable conditions. For instance, tests made on a 185 hp. B.M.W. aircraft engine at McCook Field showed a fuel consumption of only 0.42 lb. per horsepower hour. As the gallon of gasoline weighs about 5.75 lb., this corresponds to 13.7 horsepower hours per gallon. This, according to the Air Service, is the best figure ever attained in its tests and may be regarded as the practical limit for the present.

By way of contrast it is interesting to note that one of the tractors tested at Lincoln developed only 2.45 horsepower hours per gallon of fuel and the average of all sixty-five tractors tested was only 4.5 horsepower hours per gallon. This average would be even lower if the few tractors burning gasoline had been disregarded, as these on the whole consumed relatively less fuel than the kerosene tractors.

There is just as much energy in a gallon of kerosene as there is in a gallon of aviation gasoline; slightly more, in fact. That the fuel economy of tractors is only about 50 per cent that of fairly large stationary gasoline engines is due chiefly to two causes, as follows: (1) Low compression must be used with the kerosene to prevent knocking, and (2) a good deal of the kerosene either passes through the engine unburned or else burns so late in the power stroke that practically none of the heat of combustion can be turned into useful work.

It may seem unfair to make a comparison between the fuel economy of a tractor engine burning kerosene and a large size aircraft engine burning a special grade of gasoline, as there is very little chance of attaining the economy of the latter with the former. A more useful comparison is obtained if we confine ourselves to apparatus using the same grade of fuel and working under similar conditions. In this connection it is of interest to note that the best performance from a fuel economy standpoint in the Nebraska tests was 6.57 horsepower hours per gallon, as compared with a low figure of 2.45 h.p.h. These consumption figures were obtained while the tractors were on an endurance run in which it was important that they should maintain their rated output. It is not at all unlikely that in some cases the poor economy is due to difficulty in maintaining the rated power, fuel being used in excess to increase the output, but it is doubtful if higher economy would be obtained in regular service.

Industry Looks for Steady Gains

Optimism Reigns at N.A.C.C. Meeting

Shows Break Depression—Farmer Buying Weak — To Push Safety Campaign

NEW YORK, March 5 — Sane optimism pervaded the members' meetings of the National Automobile Chamber of Commerce here this week. The spirit manifested was in marked contrast with that which has been apparent for the past few months. The manufacturers are convinced that the tide of business depression has turned and that the trend of trade will be steadily upward from now on.

While the manufacturers were confident that the readjustment of the industry to post war needs has progressed well beyond the turning point, they do not expect a record-breaking business in 1921 but they do believe that sales will exceed the fondest hopes they dared express two months ago. At that time they were hopeful, but not sanguine, that the shows would bring a resumption of buying. Now they are convinced that the annual expositions have done more than they ever did before for the industry.

There was a perfectly frank discussion of the situation among both passenger car and truck manufacturers. The situation in the passenger car field is undeniably better than in the commercial vehicle end of the business but the market for trucks is strengthening.

Business has not gone ahead by bounds but the expansion has been steady although slow. The belief is almost unanimous that it will continue and that the volume of orders which has been coming to factories the past few weeks has not been a mere flash in the pan.

South Weakest Trade Point

Reports gathered from 20 distribution centers by the National Automobile Dealers Association were read to the manufacturers. They showed a decided upward turn in sales everywhere except in the south and in South Dakota. They have risen to 75 per cent of normal in some districts. There has been a marked increase in sales of used cars but they have been made at much reduced prices. This opens the way for sales of new vehicles.

The improvement in business has come chiefly in the larger cities and trade still is dull in the smaller cities and in the rural districts. Two factors are largely responsible for this condition. One is the fact that the purchasing power of the farmers has been largely reduced and the other is that the credit situation in the rural sections still is unsatisfactory. The resources of small town banks are mostly tied up in frozen loans and many of them have borrowed as much as they can from the Federal Reserve or from the larger banks with which they have connections. Credit conditions in the larger cities are no worse and in some places are better.

One of the chief obstacles in the way of sales in the truck field is that the railroads now have more idle cars on their lines than they have had in ten years. This number is now approaching half a million. The falling off in freight has been the direct result of business depression and has limited the market for trucks.

Ex-Governor Smith Talks Trucks

The truck manufacturers were addressed by Alfred E. Smith, former Governor of New York, who is now chairman of the board of the U. S. Trucking Corp. in this city, the largest company of its kind in the country. He pointed out that storage facilities for trucks are entirely inadequate and that if they were enlarged there would be a much better potential market. His own company leaves in the street each night, 2000 horsedrawn vehicles but it must find roofs to shelter its trucks. There are almost no storage facilities in lower New York.

Both passenger car and truck makers were addressed by John Moody, president of Moody's Investors Service, who discussed "business and financial conditions and how they affect the automobile industry." He emphasized strongly his belief that 1921 would be a year of adjustment for the industry. He declared that no one industry can stand out against lower prices and asserted that even the cost of steel must go down.

While in New York, the manufacturers discussed informally among themselves means they are employing to assist the small down dealer in promoting sales. Several companies are giving these dealers advice and assistance not only in salesmanship, but on finance.

A decided stimulus to the work of accident prevention is expected to follow the appropriation by the directors of $5000 for prizes to school children of the United States for the best essays on how to lessen the number of automobile fatalities. The plan for offering these prizes has not yet been worked out in detail and other agencies engaged in the same work will be consulted before the regulations covering the contest are announced.

Should Check Accidents

The N. A. C. C. directors feel that it is distinctly up to the automotive industry to help prevent accidents. They are much concerned over the situation and believe many of the fatalities are due to the overloading of trucks, the lack of playgrounds for children and reckless driving. While 78 per cent of the automobile accidents are due to the carelessness of pedestrians themselves, the frequency which such accidents are occurring, is injuring the industry.

The N. A. C. C. does not believe the examination of drivers will do any good,

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MELLON NOT COMMITTED ON TAX PROGRAM; IMPORTANT CONFERENCES SET FOR THIS WEEK

WASHINGTON, March 7.—Secretary of the Treasury Mellon to-day advised AUTOMOTIVE INDUSTRIES that he had not formed definite plans as to tax recommendations. The secretary stated that he would give this subject thorough consideration and undoubtedly map out a tax program for submission to Senate and House Committees early in April. He has not committed himself to proposed revisions though it is known that as a banker he held very decided opinions concerning the need of abolishing the excess profits tax and providing more equitable substitutes. Before taking office he intimated he favored a corporation tax and a small retail sales tax.

It is understood that the secretary will confer with President Harding this week in an effort to obtain his views on this vital matter. Chairman Fordney of the House Ways and Means Committee, Senator Penrose, chairman of the Senate Finance Committee, and other congressional leaders directing fiscal legislation, have been summoned for conferences with the chief executive. These conferences will have an important bearing on hearings which are scheduled for early April.

The Senate committee on appropriations reported that the last Congress reduced the total appropriations by nearly $1,500,000,000 from official estimates for expenditures during 1922 and approximately $900,000,000 less than total expenditures for 1921. These reductions would indicate a lower tax rate but many bills have been vetoed and may be reintroduced with larger amounts, so that actual expenditures authorized will be difficult to determine for several weeks.

Klingensmith Joins Gray Motors

To Work with Beall on New Light Car

Will Start Production in Summer —Company Has Strong Financial Backing

DETROIT, March 8—F. L. Klingensmith, former general manager of the Ford Motor Co., set at rest rumors as to his future plans by the announcement to-day that he would associate himself with F. F. Beall, former vice-president in charge of manufacturing of the Packard Motor Car Co., in the production of a new 4-cylinder car to retail at around $1500. Associated with Klingensmith and Beall will be W. A. Blackburn, former factory manager of the Cadillac Motor Car Co. who will occupy the same position with the new concern.

The new company will be known as the Gray Motor Corp. and is a reorganization of Gray Motor Co. which has a large plant at Mack Avenue and Terminal Railroad where the company has been manufacturing engines for several years.

Beall joined Gray Motors upon his resignation from the Packard Co. last summer and has developed a high grade engine which has proved a success. The corporation is well equipped for the manufacture of engines in large quantities for commercial use in addition to its own car requirements.

The car will be brought out in the summer. It will have a 112-inch wheelbase, 3½x5 engine and unusual body lines. The success of Beall at the Packard plant assures the highest grade workmanship on the new product. The car will be marketed through 10 distributing centers, each with an assembly plant, and cars will be shipped from Detroit unassembled, reducing sales expense and freight and it is contemplated by this policy to sell the car at the same price in every city. The same arrangement will be carried out in foreign fields.

Directors Name Officers

At a meeting to-day of directors of the new corporation, Klingensmith was named president; Beall, vice-president and general manager; G. H. Kirchner, president of the First State Bank of Detroit, treasurer and J. B. Moran, secretary and assistant treasurer. Klingensmith was with the Ford company for 15 years and the last six years as vice-president and treasurer. He resigned Jan. 1. Since that time there has been much speculation as to his future and the announcement of a combination with Beall is pleasing to his friends.

Klingensmith's long experience with Ford in financing and sales, Beall's mechanical and production experience and the financial backing of men prominent in money circles, are believed to assure the development of another large automobile company in Detroit. In a statement to-day Klingensmith said:

"I consider myself especially fortunate in being able to form a partnership with Beall in view of his splendid training and long experience in quantity production of high grade automobiles. He received his early training in bicycle manufacturing and later spent 12 years with Brown & Sharpe at Providence, R. I., became an official and left the company to join the Packard organization. I consider Beall the best qualified man in the automobile industry to-day from manufacturing, designing and metallurgical experience to develop a new car." The car will be known as the Gray and, equipped as it will be, is expected rapidly to take rank with popular-priced cars now in the market.

SHORT MONTH HINDERS NEW FRANKLIN RECORD

SYRACUSE, March 7—The extra working day in February, 1920, was the only thing which kept the H. H. Franklin Mfg. Co. from setting a new February production record this year.

Shipments for the month totalled 952, thirty-five less than was turned out in the leap year February. The factory was on a 40 car a day schedule which would have carried it over the top by five.

During February the total number of orders received aggregated 1107, the output falling 155 short of meeting demand. Only 850 cars had been scheduled for the month's output but this was increased when the heavy flow of orders became apparent.

The March schedule calls for production of 1031 cars.

Firestone to Decide on Production Policy

AKRON, March 7—Directors of the Firestone Tire & Rubber Co. will meet March 11 to act on the quarterly dividend payment due this month, and also to make definite decision as to the extent of contemplated increase in production. Although Firestone is not contemplating employing any more men for the time being, it is understood that the company plans an appreciable production increase early in April, and expects to follow it with a still greater increase about the first of May.

Economy Forces Out Overland Officers

Assistants Take Over High Positions—Think Production Near —Contracts Changed

TOLEDO, March 7—The policy of enforced economy in the Willys-Overland Automobile Co. here was emphasized again this week when President John N. Willys, here for three days, announced the severing of relations of Treasurer Frank K. Dolbeer with the company. Dolbeer will be succeeded by his assistant, J. H. Gerkens, in handling the finances of the company.

Dolbeer has been associated with Willys for many years. It was while John N. Willys was operating a bicycle repair shop at Elmira, N. Y., and selling talking machines on the side that their friendship began. Dolbeer was "on the road" for a phonograph company. When Willys began to build up his organization here he summoned Dolbeer for one of the big tasks.

The company has not made any announcement of its production plans. The number of cars on hand is down to the very minimum now and production is expected on a small scale most any time. A few Willys-Knight fours are being built now—most of them directly on order of the dealers.

Willys held several conferences with Walter P. Chrysler, the executive vice-president, and Charles B. Wilson, vice-president in charge of the Toledo plant. The policy adopted in regard to economy and building up a new organization has been carried out in disposing of several contracts this week.

The advertising contract, which has been held by the Martin V. Kelly Co. since the beginning of the company's operations here and which is one of the largest contracts of its kind in the world, has been turned over to another firm.

It is understood by Toledo bankers that the bankers' creditors' committee has practically forced President Willys to give over control of the plant to Chrysler, with full power to weed out all unnecessary individuals.

At the present time there are only one or two of the old family of officials left at the Toledo plant. Most of the places made vacant have been taken over by assistants, come up through the ranks.

HENRY FORD D. T. I. PRESIDENT

DETROIT, March 7—Henry Ford has been elected president of the Detroit, Toledo & Ironton Railroad to succeed Joseph A. Gordon. Several other changes were made.

U. S. Army Trucks Sadly Depreciated

Stocks Left in France Allowed to Go to Ruin Through Lack of Care, Reports Show

Complete official inventories of American army supplies sold to France show that on Nov. 1, 1920, their value was 2,066,800,000 francs or $413,360,000 at the normal rate of exchange. Motor vehicles and automotive supplies represented 326,800,000 francs or $65,360,000. It is understood that an effort will be made to reimport to the United States, duty free, an enormous quantity of these stocks, not only automobiles but other goods.

PARIS, Feb. 18 (*Special Correspondence*)—All American Army stocks in France are expected to be liquidated by the end of next July, according to a statement made before the French parliament. Two of the biggest American automobile camps have been disposed of. They are the Pruniers camp, near Romorantin, which has been sold to the Parrot Company for 35 million francs and the Bourg camp, near Langres, sold to the Meynil & Souchal Company for 25 million francs. The M. T. C. repair park at Verneuil, which was the biggest single organization of the Motor Transport Corps in France, has not yet been sold.

Emmanuel Brousse, in a long speech before the French House of Representatives, has given close details of the manner in which the American stocks were received by the French and disposed of by them. For more than a year Brousse was in charge of the liquidation of stocks, and although his speech was a justification of the work he did, he did not hesitate to point out the gross mismanagement and the scandals connected with this organization.

Stock Sold for $400,000,000

The American stocks were purchased in July, 1919, for 400 million dollars, at a time when the dollar was worth about 7 francs, but owing to carelessness or neglect the value of the dollar was not fixed when these negotiations were concluded, so that the French Government does not know how much it will have to pay for the material received. Wholesale robbery of the American camps began before the American army left France, and was continued on even a bigger scale when the troops had gone home. While the American Army had 100,000 men to police their forty parks, the French had only 1500 troops. The Quartermaster Corps depot at Gievres, guarded by 18,000 American troops, was entrusted to 800 French soldiers.

An American captain, according to Brousse, stole 1500 Cadillacs from the Montoir camp, in addition to thousands of tons of goods, sufficient to load two steamers, which were sent from St. Nazaire to America. The captain was sentenced to one year's imprisonment by the Poitiers court.

The camps were generally so difficult to reach, and the vehicles were generally so deeply bogged that all but a few professional speculators declined to attempt to reach them. Brousse inaugurated the system of selling complete camps, in contra-distinction to the earlier method of disposing of single vehicles or small groups. The results in the case of the Bourg and Romorantin parks were marvelous. An expert's report on the automobile camp at Bourg in which the M T. C. left 9000 automobiles, states under date of July, 1920, that this camp, which is four miles from the town of Langres, is on clay ground of such a nature that the slightest rain makes all work impossible.

From the end of September it is practically impossible to operate this camp, and if the material is allowed to remain there until the end of December, 70 to 80 per cent depreciation will have to be allowed for. In winter it is very common for this country to be covered with more than 3 feet of snow.

Important Repairs Needed

At least 50 per cent of the automobiles are in a very bad mechanical condition by reason of their exposure to the elements and the long time they have remained in the mud. Not a single vehicle can be considered in new condition, and all of them need very important repairs before they can be used. Many of the aluminum crankcases have been attacked by the acids contained in the soil. Quantities of frame members are warped by reason of the trucks bedding in the mud. There are no facilities for repairs, much of the material is standing out in the open, and the sheds are in such poor condition that they cannot last through the winter.

No inventories existed when the stocks were taken over. Nobody knew what was in the camps, nobody knew where material was to be found. The American Army declared it left behind 65,000 automobiles, while the French estimate that they did not receive more than 40,000. There were 200,000 boxes of automobile spare parts which had not been opened when the French took charge of the stocks, and nobody knew exactly what these boxes contained.

SLOUGH TRUCK SALE POOR

LOS ANGELES, March 8—Indications are that the sales of American army trucks reimported into this country from England by the Slough Trading Co. have undergone a bad slump. When the sales began the representative here of the British company did a good business, but trade soon fell off and more than half the consignment of 75 is still on hand. There is very little mention heard now of these army trucks.

Pocket Veto Kills Truck Dumping Bill

Much Legislation Unfinished as Congress Ends Session—Economies Affect Industry

WASHINGTON, March 7—President Wilson's pocket veto of the Army appropriation bill put an end to legislation designed to sell or transfer surplus army trucks and automobiles. The Senate and House had passed the bill as received from conference in which the House conferees had prevailed upon the Senate managers to an amendment requiring the sale of not less than one-half the surplus trucks and cars.

The conferees could not agree as to appropriations for the Air Service which the Senate insisted should be adequate. The Senate failed to reach a vote on the Naval appropriations bills and as a result the item for purchase of aircraft equipment will be carried over into the extraordinary session. The Senate amendments concerning the disposition of tractors as carried in the Fortifications bill were accepted by the House and the measure received the approval of the President before his retirement from office.

Under the terms of this bill, the War Department is authorized and directed to transfer 1250 tractors to the Bureau of Good Roads for distribution to the States for use on highways. Senate leaders and War Department officials predicted that the transfer will put the Army on the market for new tractors within a year.

The adjournment of the Sixty-sixth Congress left many pressing bills on the calendar for reintroduction at the present session. One of the notable features of the past session was the failure of the Senate to approve the continuation of the Federal aid appropriations. At the time of the rejection of State aid program it was indicated that the plan of national highways indorsed by the automotive industry would be given consideration at this session.

Defense Council Cut Off

The policy of economy pursued by the House and Senate affected many Governmental organizations in which the automotive industry had a direct interest. The Congress failed to provide funds for the maintenance of the Council of National Defense, which had under way several studies in standardization and highway transport. It is stated, however, that pressure will be brought to bear on the Sixty-seventh Congress for a special appropriation that the work may continue.

Recommendations of the Secretary of Commerce for the extension of the research activities of the Bureau of Standards into problems relating to the automotive industry were ignored by the House and Senate and, as a result, the activities of the Federal scientists will be restricted.

Associations Near Unity on Tax Views

N. A. C. C. and Rubber Association Committees Reach Agreement—Sales Tax Favored

NEW YORK, March 7—Considerable progress has been made the past two weeks in the direction of concerted action by all branches of the automotive industry on the question of Federal taxation. It is confidently believed that before hearings are begun by the House Ways and Means Committee at the extra session, the various organizations representing the industry will have united upon a definite program.

A working agreement already has been reached between the tax committees of the National Automobile Chamber of Commerce and the Rubber Association of America. The committees of the two organizations presented to their directors reports which were practically identical. Both called for economy in governmental affairs, especially in relation to the military establishment, for the funding of the war debt and for a sales tax to provide whatever additional revenue is necessary.

Directors of the National Automobile Dealers Association have decided to stand with the N. A. C. C. on the tax question. A similar position will be taken by the American Automobile Association, and the Trailer Manufacturers Association is expected to fall in line. The Motor and Accessory Manufacturers Association has not yet appointed a tax committee, but it has been committed informally to some form of sales tax, and it is hoped that its views will be adjusted to those of the other organizations.

The tax committees of the N. A. C. C. and the Rubber Association have begun energetically the work of gathering statistics and data regarding the views of other associations on the tax question and will strive to convert as many as possible to their views. As a matter of fact, considerable progress already has been made in this direction. The sentiment in favor of a sales tax instead of increased excise taxes upon industries which have been classed unofficially but arbitrarily as luxuries is growing, in spite of the recent referendum of the United States Chamber of Commerce.

Sales Tax Easy to Collect

The general belief is that a tax on retail sales will be more easily collected than a turnover tax. Estimates show that it would yield all the revenue necessary and that it would impose only about one-quarter as heavy a burden on the ultimate consumer as a turnover tax.

C. C. Hanch, chairman of the N. A. C. C. tax committee, will spend the next few days in Washington investigating the tax situation. No attempt will be made to obtain the views of legislative leaders until the extra session begins. The House leaders themselves, who will initiate the tax legislation, are not united upon any plan. The chief objection to a sales tax is that it would fall directly upon the ultimate consumer whose vote might be influenced by the feeling that he has been discriminated against. Economists agree, however, that this form of tax is the most equitable which can be imposed, and efforts will be made to show consumers that they will pay the taxes, no matter what form they may take.

Representatives of the various organizations connected with the industry are expected to meet frequently for a discussion of the tax program. While it is believed they will unite upon a plan, it is probable each branch of the industry will ask for a separate hearing at Washington rather than make an appearance as a united industry with a single spokesman.

Raw Material Prices Retard Normal Return

WASHINGTON, March 5—Nation-wide inquiry by agents of the Federal Reserve Board shows that the movement toward better conditions was slightly retarded during February principally on account of changes in the prices of basic raw material. Consumers were apparently uncertain as to the trend of prices inasmuch as current purchasing was restricted to immediate needs. One of the encouraging features of the past month was the improvement in employment.

The Board stated that the price reduction in semi-finished and finished steel products, as quoted by independent steel producers, and those in crude and refined oils, disturbed conditions for a time. The month was quiet financially with only a moderate demand for investment securities. Wholesale prices in January declined somewhat less rapidly than in December. The discrimination in purchasing as evidenced in the retail trade brought about movements towards lower price levels. Throughout the agricultural districts it is reported that the mild winter has been highly beneficial to crops and undoubtedly spring truck crops will soon be moving. This fact would indicate a renewed use of motor vehicles in transporting the farm products.

ADD TO FOREIGN TRADE BOARD

NEW YORK, March 7—Three new members have been appointed to the organization committee of the Foreign Trade Finance Corp. They are H. M. Swetland, president of the United Publishers Corp. and the National Publishers Association; W. C. Redfield, former Secretary of Commerce, and Jerome T. Thralls, secretary of the Discount Corp.

DEARBORN OFFICERS CHOSEN

KALAMAZOO, MICH., March 5—The Dearborn Equipment Co. at its annual meeting named the following officers and directors for the ensuing year: President, J. H. Penniman; vice-president, J. W. Bermes; secretary-treasurer, C. S. Bush; directors, the above and H. B. Garvey and William Shakespeare, Jr.

Goodyear Holders Favor Finance Plan

Unanimous Consent of Merchandise Creditors Sought Before Stock Meeting

AKRON, March 7—A canvass made by officers of the Goodyear Tire & Rubber Co. shows that sufficient personal and proxy votes of stockholders have been received to ratify the $85,000,000 refinancing program. It is hoped that when the meeting adjourned from March 4 to March 15 is held practically all of the merchandise creditors will have given their consent. More than 80 per cent already have done so. It is now believed that adoption of the plan is assured. In announcing the adjournment of the special stockholders' meeting, a statement was issued which said:

"Officers of the Goodyear Tire & Rubber Co. announce that they have been advised by the merchandise creditors' committee that owners of more than 75 per cent of the merchandise indebtedness dealt with by the 'plan of readjustment' have consented to the plan. While the company is gratified at the progress made by the merchandise creditors' committee, in view of the large amount involved, the plan cannot be carried out so long as creditors holding any substantial amount of the company's debt have not assented.

"Accordingly, the company does not feel justified in completing the changes in its corporate structure contemplated by the plan until substantially all the creditors have filed their assents with the committee, and the meeting of the stockholders called for to-morrow, March 4, will be adjourned until March 15, by which time it is hoped that the remaining creditors will have signed assents."

It is understood that some creditors who have refused to assent to the plan, are holding out in the hopes that as a last resort, interests friendly to the company will buy them up, and thus enable them to settle their accounts in full for cash rather than to accept part in cash and the balance in prior preference stock. Although it is considered probable that such steps might be taken it is stated that too large an amount of merchandise indebtedness is represented.

To Pay Stock on Contracts

Just what effect this attitude will have upon the final consummation of the plan is problematical. Unanimous creditor assent is sought by March 15. It is understood all merchandise claims of under $1000 will be paid in full. It is also understood that the plan of readjustment stipulates 25 per cent cash payments and the balance in prior preference stock, on all merchandise indebtedness. Men familiar with the details of the refinancing plans say contract creditors will not be paid any cash in settlement of claims, but will receive $125 in prior preference stock for every $100 of indebtedness held.

Cleveland Factories Increase Production

Outlook for March Business Is Pronounced Good—February Much Improved

CLEVELAND, March 5—February's business at all automobile plants in this city exceeded by a good margin the volume in the previous month.

Reports from the Grant factory indicate a very favorable business this year. January's production program of 150 cars was exceeded, and when the books are closed for the month of February the program of 250 cars for the second month of the new year will have been exceeded. Orders are on the books for 200 cars for delivery in March, while the program for March calls for 300 cars. As the Grant Co. is now using the Walker motor exclusively, the latter company also has increased production greatly in the last two months.

The Templar company also has enjoyed good business thus far in the new year. February sales tripled those for January, while March business already booked far exceeds the business done in January.

At the Winton company, where operation has been greatly limited for some time, in common with other factories, production is to be increased on March 15. Already workmen have been notified to report, and machinery has been thoroughly overhauled. The company expects April to be a better month than March, while business booked for March is better than the record for January.

At the Chandler plant it was stated that the volume of business in February was greatly in excess of that in the previous month, and that the management is looking forward to better business in March.

The Peerless management reported an increase in the month just closed over the record for January, while March is expected to prove that a genuine business revival is on.

Allen Motor Reduces Receiver Indebtedness

COLUMBUS, March 7—The affairs of the Allen Motor Co. are in a better position now than they have been since the receivership began, according to a report submitted by a creditors' committee headed by R. C. Wolcott. A reorganization of the personnel has been made whereby the overhead has been reduced $6,600 a month. Orders have been coming in at an encouraging rate. Those now on hand number approximately 300, of which 69 are for immediate shipment with payment upon delivery. No cars are being shipped to dealers who cannot pay cash. Shipments in February numbered 54 cars.

Receiver's indebtedness was reduced $49,000 in February and outstanding drafts were reduced $80,000. It is hoped that by April 1 all receiver's indebtedness can be paid exclusive of receiver's certificates, as well as all bills for current requirements, and that during April some headway can be made in the reduction of the receiver's certificates. Purchases will be confined to actual requirements against bona fide orders for immediate shipments, and no further accumulation of inventory will be permitted. Altogether the situation is more hopeful than it has been at any time since the receivership began.

BUSINESS RENEWALS

EAST PALESTINE, OHIO—The McGraw Tire & Rubber Co. has resumed operations on a limited scale after having been closed for several months. Manufacture of tubes and tires has been begun.

BEREA, OHIO—The Dunham Co., manufacturers of automobile castings, is turning out a considerable quantity of castings for customers in various parts of the country. It has a daily capacity of from 125 to 150 tons.

CLEVELAND, OHIO—The Pennsylvania Piston Rings Co., Inc., manufacturers of individual cast piston rings, started operations on a full time basis March 1 in its foundry and machine shop.

STOCKTON, CAL.—The Croyer Motors Co. has broken ground for the first unit of its new plant in which a new type of tractor will be manufactured. This company formerly made the Sampson tractor but its plant and equipment were sold to the General Motors Corp. The first unit is to be a building 90x440 feet.

PHILADELPHIA—The L. H. Gilmer Co., manufacturers of belting and other woven products, announces that it has accumulated sufficient orders so that the main factory at Tacony is running full time and two departments with double shifts 18 hours a day. The company says that prospects are very bright for a satisfactory year.

SPRINGFIELD, OHIO, March 4—Sales demands are beyond expectations, said officials at the Springfield works of the International Harvester Co. Since the first high speed trucks have been delivered there is a general demand, it was stated. Production at the Springfield works is now under headway. The indications are that the big plant will be called upon to increase the schedule.

SPRINGFIELD, OHIO, March 4—During a visit of officials of the Kelly-Springfield Motor Truck Co. from New York and other points to the plant here it was stated that the indications are that the plant will soon be under headway and that the outlook for the year is encouraging.

Optimism Reigns at N. A. C. C. Meeting

Will Expand Statistical Department—To Join International Commerce Chamber

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for investigation discloses that good but reckless drivers are responsible for most of the mishaps which are not due to pedestrians themselves. Strict enforcement of the present motor vehicle laws would do much to remedy the situation. In most states the statutes are adequate for proper punishment of careless drivers, either imposing jail sentences or forfeiture of license.

The directors decided to expand the statistical department of the N. A. C. C. and in the discussion of this subject there was much commendation of the statistical number of AUTOMOTIVE INDUSTRIES. It was felt that by the expansion of the department, further valuable aid would be given such publication in the preparation of statistics of the industry.

It was decided to join the International Chamber of Commerce because it was believed it would be a stimulus to the development of foreign trade. J. Walter Drake, chairman of the export committee, urged the members of the chamber to give their wholehearted support to the Foreign Trade Finance Corp. which recently has been organized.

Toledo Parts Factories Report Larger Orders

TOLEDO, March 7—Allied industries at Toledo are showing signs of business pickup. The Bock Bearing Co. reports that its outlook for March is 50 per cent better than February. The plant here was operated for the first 15 days of last month.

The Tillotson Mfg. Co., which makes carbureters, reported that a few more workers may be put on production later in the month. President H. C. Tillotson says orders are growing but most are being filled out of stock which the company accumulated during the fall.

J. W. Bunting, president of the Bunting Brass & Bronze Co., declared that business was steadily increasing and that his plant would increase its output if improvement continued.

Most automobile manufacturers here believe that 1921 will be a "40 per cent year."

WHITE WORKS TWO SHIFTS

CLEVELAND, March 7—The White Motor Co. now has a working force of 5000, which is divided into two groups of 2500 each. Each group will work three days a week and there will be no change in wage rates at present. About 1200 men were laid off March 1. When men are hired later on it probably will be at a slight increase.

Miller Tire Surplus Nears Depletion

Calls in Stocks to Meet Demands —To Go Slow on New Production

AKRON, March 8—Miller Rubber Co. is the first tire concern to announce that the predicted tire shortage has arrived, By order of Akron officials of the company all available supplies of tires are being brought in from branches in sections of the country where sales are slow, in order to meet the rush demand for orders from dealers in other sections of the country.

Miller has taken this means of meeting heavy spring demands, rather than to immediately quicken production, as it will create a quicker turn-over of stock and enable the company to enter a more stable basis of production when an increase of marked proportion is deemed necessary.

This same policy is being adopted by practically all other Akron tire concerns which are endeavoring to have factory stocks completely absorbed before any heavy production increases are enforced. All factories report surplus stocks diminishing rapidly, and have issued statements indicating that as soon as such supplies are completely exhausted, production will be increased commensurate only with actual current demand.

This is taken to mean that it will become the policy in the rubber industry in the future not to provide too far in advance, but to keep production on an even keel and parallel with actual demand, so as not to clog dealers' shelves with surplus stocks, and so as also to prevent a repetition of the crisis and necessary heavy retrenchment in the tire industry, created when sales slumped last year. Had rubber factories at that time not had surplus stocks on hand, and had they reduced production so as to hold it even with actual demand, practically all such concerns would have breezed through the depression period with small losses.

DETROIT EMPLOYMENT GAINS

DETROIT, March 4—The Employers' Association of Detroit reports 8008 additional men employed in the 79 factories affiliated with the association during the last week in February. On March 1 the 79 firms were employing 62,878 men. This is a gain of 17,905 since Feb. 1. Constant addition to the employees' roll at the Ford plant has had much to do with the increase.

JIG BUSHING TO START WORK

PONTIAC, MICH., March 4—The Jig Bushing Co., makers of bushings for automobile plants, will start production on a full line of its products at its new factory here, April 1. The concern is a new one in the local field and is owned by O. R. Briney of Pontiac and L. M. Richards of Cleveland.

CARS FOR CLERGYMEN TO DOUBLE EFFICIENCY

CHICAGO, March 7 — "Every pastor should have a car," is the assertion made in an editorial printed by the *Northwestern Christian Advocate*, one of the official papers of the Methodist Episcopal church.

"The minister's efficiency is doubled, trebled and even quadrupled by the use of the 4-wheeled chariot of the Apocalypse," says Dr. E. Robb Zaring, the editor. "He can visit sections where shoes, horse or human, could not penetrate. Every pastor should have a car, every rural pastor particularly. The people that the rural pastor serves probably have theirs. Pass prosperity to the parson."

Improvement Gratifies Milwaukee Industries

MILWAUKEE, March 4—Concerns in the automotive parts and equipment industries in Milwaukee and vicinity report a gratifying betterment in their business, which consists of something more than feeling, according to the latest review of local conditions compiled by the First Wisconsin National Bank of Milwaukee. The summary says:

"One company reports a sales increase during the past month of about 100 per cent over the previous month.

"The automotive industries do not expect to do any such an amount of business as last year. Only a fair year is expected. Necessary replacements of parts and accessories in itself provides a medium of business for firms engaged in this line.

"Milwaukee motor truck interests report improved prospects. The outlook for trucks this year looks a little better than that for passenger cars. Future prices in parts and accessories depend upon what happens in the steel market. None of the Milwaukee plants are yet operating above 50 per cent of capacity. Little dependence is placed on export business for this season."

PETERS CUTS BODY PRICES

BALTIMORE, March 5—The Peters Auto Body & Spring Works has made a 15 per cent reduction in the prices of commercial automobile bodies. This was made after a careful study of the present situation by Charles H. T. Peters, who decided to give the public advantage of lower prices without reducing the quality of the bodies built.

OAKLAND BODY PLANT STARTS

PONTIAC, MICH., March 4—The Oakland Motor Car Co. resumed operations in its body plant here, giving employment to 200 men. The Standard Parts Co., which has been closed for some time, expects to resume next week with a force of 150 men.

Australia Looks for Return to Buying

Improved Crops Expected to Bring Easier Conditions— Favor British Products

SYDNEY, NEW SOUTH WALES, Jan. 28—(Special Correspondence)—Automobile trade in New South Wales has slowed up seriously since last October because of the expectation of a fall in prices. Many prospective purchasers canceled their orders and prospects have been hard to find. The one encouraging factor in the situation is that there are comparatively small stocks on hand in Australia and the supply on hand will not last more than four months even with the few sales now being made.

The shortage of stocks is due to cancellations by dealers when the buyers' strike began, and further cancellations resulting from inability to remit payments because the banks could not sell Australian drafts. Added impetus to cancellations was given by the expected advent of European cars. The Government and newspapers have urged that English goods be pushed for patriotic reasons and this has had its effect.

Purchasing power in Australia has been limited because of short crops for the past few years resulting from droughts. The drought has now broken, however, and it is expected that many persons who have been clinging to their dilapidated motor vehicles will soon be in the market for new cars. A marked increase in business is expected by May or June if prices become firm.

Another serious factor is the high price of gasoline, which is now selling at $1 a gallon. There is slight probability of production of gasoline in this country in the near future.

While motor trucks are not popular in Victoria and South Australia, there is a good market for them in New South Wales, which has more of them than all the rest of Australia put together.

Truck Manager Finds Service Methods Wrong

NEW YORK, March 4—Manufacturers, dealers and service men alike were criticised last night by C. R. Collins, general manager of the National Association of Commercial Haulers, in an address before the Automotive Service Association of New York. He cited many instances to prove that the service is not satisfactory and told of the growing installation of private repair shops by large fleet owners and of the associations of passenger car and small truck owners, maintaining cooperative shops.

Collins said that if service conditions do not improve materially, some system such as the English and Continental guilds will step into the place and all purchases and repairs will be made collectively and without the necessity of the middleman.

Trucks Gain Trade As Railroads Slump

New England Shippers Find Rail Lines Inefficient and Rates Unsatisfactory

BOSTON, March 5—It has been admitted that Boston business houses have been driven to the use of motor trucks because of the breakdown of the railroad transportation system in New England.

Action by the board of directors of the Boston Chamber of Commerce in voting to ask an investigation of New England railroads by the Interstate Commerce Commission, and that of the executive committee of the New England Traffic League in sending an open letter to the directors of the New England roads calling for the removal of heads of these companies, created a decided stir in railroad circles yesterday.

While both organizations aim to bring about the same result—a more efficient handling of New England railroads—they have adopted different methods, the former making its appeal to Washington, whereas the Traffic League wants to deal directly with the directors of the roads.

Both organizations set up the claim that there should be an inquiry as to whether the roads are being operated efficiently and economically.

Speaking through the transportation committee of the Associated Industries of Massachusetts, which is the clearing house for more than 1600 interests in this State, the industrial forces of the Commonwealth have emphatically declared that the proposed 10 per cent advance in steam railroad rates will not solve the railroad problem for New England.

In a statement issued to-day by the committee, of which W. P. Libby, traffic manager of the Plymouth Cordage Co. of Plymouth is chairman, the Associated Industries of Massachusetts said:

"The Associated Industries of Massachusetts has learned that 250 industries are now using motor trucks in competition with the railroad, and this results in a net loss in revenue to the New England railroads of approximately $2,000,000. The 1914 census of manufacturers shows that there are in New England 19,660 separate and distinct industries, and this may possibly furnish a proper basis upon which to estimate the total net revenue loss to our New England railroads.

"The investigation of the motor truck competition reveals the fact that there are hundreds of instances of great differences in costs. A few of the items are as follows:

"Boston to Lynn, shoe findings, railroad rate 34½ cents, motor truck rate 22 cents.

"North Dighton to Boston, textiles, railroad rate, 37 cents, motor truck rate 35 cents.

"Boston to Fitchburg, confectionery, railroad rate 46 cents, motor truck rate 40 cents.

"Lowell to Boston, the railroad rate on the first three classes comprising thousands of articles ranges from 31 cents to 46 cents per 100 pounds, while the truck rate ranges from 30 to 40 cents.

"These specific instances are much more impressive in consideration of the fact that the motor truck rates in every instance include store door pick-up and delivery service, whereas to the rail rate must be added for the same service a surcharge of from 15 to 25 cents per 100 lbs. or per package for delivery.

"Another factor that should also be taken into consideration is the fact that the average saving in time by truck transportation as against railroad service on 144 routes is 44.65 hours per route.

"It is no secret that there is a movement on foot to establish motor truck and steamship service on points such as Bridgeport, New Haven, New London, Providence, Fall River, New Bedford, Boston, Beverly, Portsmouth, Portland, Bangor, etc. The establishment of such service in co-ordination with the truck lines from the important industrial centers will have a disastrous effect on the revenues of the railroads."

Reduction of labor costs, these Bay State industries claim, is the only relief for New England railroads.

African Gold Coast in Market for Trucks

OTTAWA, ONT., March 4—Writing to Ottawa from the Gold Coast Colony, West Africa, Canadian Trade Commissioner W. J. Egan states that the colony will shortly be in the market for motor lorries. The standards required are to carry a load of ½ ton and 1 ton. The total weight of the lorry and one ton freight must not exceed 5000 lb. while the ½ ton capacity motor lorry is naturally expected to weigh less.

The price set by the Government is from $2000 to $2500 but they may consider $3000 if necessary.

If the running mechanism is such that a speed of not over 15 miles per hour can be made this will be a strong recommendation. A certain lorry has been in use but the desire of the authorities is to get a lorry better suited to their needs than the present one, that is, one that will stand up against the strain of a tropical country and give a reasonable time of service. Drivers are raw natives so a fool-proof style of lorry is necessary and if the proper car can be introduced this will be made a standard and as the transport of the country is very largely motor, orders for vehicles would amount to hundreds each year.

Orders will be placed in April this year and prices of spare parts and the capacity of the factory should be given with any other particulars thought advisable.

FORD CLEANS OUT GROCERIES

DETROIT, March 4—Ford Motor Company is liquidating the stock of groceries and will discontinue its grocery store as soon as stocks have been exhausted. The shoe, clothing, drug and meat stores, however, will be continued. Mr. Ford assigns his reason for closing the grocery to rapid downward trend of grocery prices.

N. A. C. C. Points Out New Truck Markets

School Consolidations Necessitate Vehicles for Pupils—Rail Rates Make Business

NEW YORK, March 4—Twelve thousand consolidated rural schools in the United States are using vehicles for transporting pupils. About half the equipment is motorized and the remainder horsedrawn. The National Automobile Chamber of Commerce has sent a bulletin to its members pointing out the sales possibilities in this field. It is pointed out also that 194,000 one-room schools not yet consolidated, promise a future motor vehicle market. Pennsylvania now has under consideration 275 new consolidations.

The use of motor vehicles for consolidated schools has been urged by P. P. Claxton, United States Commissioner of Education. The bulletin explains that J. C. Muerman of the United States Bureau of Education has provided the following suggestions on body styles:

1. Top ventilators are desirable.
2. Preferable to have driver's seat in the same compartment as passengers, so that he can keep control of children.
3. As much weight as possible needed on front wheels. Present tendency is for large school buses to have too much weight on rear wheels.
4. Two exits important, in case of fire, capsizing, or stalling in drifts.
5. Where four rows of seats, running lengthwise of bus, are provided, ample aisle space should be allowed, using maximum possible width of body.
6. Upholstery—if not too expensive, removable khaki upholstery over leather or leatherette would be preferable to plain leather currently used, as the khaki could be removed and washed.

Another bulletin sent out by the motor truck committee of the N. A. C. C. states that if railroad rates are further advanced in Massachusetts, 532 members of the associated industries of that State have stated that they would use motor trucks exclusively. In many cases this would necessitate new fleets.

A survey recently completed by the truck committee shows that 2765 Maryland farmers are using trucks. A similar survey in Kentucky indicated that there was a real need for more trucks in 13 counties.

BRITISH TO TEST TRACTORS

LONDON, Feb. 8—(*Special Correspondence*)—The 1921 British tractor trials will be conducted by the Society of Motor Manufacturers and Traders and regulations and entry blanks are now being published. One of the features of this year's demonstration will be fitting a recording dynamometer to every tractor in the field, which dynamometer will be carried throughout the demonstration. A special machine has been designed for which world patents are claimed.

Citroen Cuts Price to Absorb Taxes

Takes Action as Protest to Government — French Market Poor—Finances Easier

PARIS, Feb. 16—(Special Correspondence)—Citroen has made another cut of 10 per cent in the price of his cars, thus bringing the price of the four-seater down to 14,310 francs. The sedan is listed at 21,600 francs. This cut is made in the form of a 10 per cent discount to cover the luxury tax applied in France on all automobile sales. Instead of this tax being paid by the client, Citroen now pays it for the client, and makes use of this publicity to protest against the Government tax.

Citroen still holds the position of marketing the cheapest car of French construction on the market. Renault, who is now in direct competition with Citroen, with a four-cylinder 10 hp. four-passenger model, officially maintains his price at 21,000 francs, but as dealers hold stocks, sales are often made at 16,000 francs, and sometimes a little lower.

Since the new year the revival of business on the French market has been very slight. There is an impression abroad that further price reductions may be expected shortly, and because of this the public is holding off. De Dion Bouton is contemplating a cut of 4000 francs, thus dropping the price of the 10 hp. model from 21,000 to 17,000 francs. Price reductions up to the present have not given the results that were expected. In the case of Ford, who initiated the movement in France, there was no result at all.

A net profit of 7,126,383 francs for the year 1920 was declared at the annual meeting of the Lorraine-Dietrich Co., compared with 12,379,127 for the year 1918-19. This concern has two independent branches, the factory at Luneville being interested chiefly in railroad material, and the works near Paris producing automobiles.

The automobile program of the company consists of a 15 hp. 6-cylinder automobile of high grade, but laid out with a view to cheap quantity production. Although the car was shown at the automobile exhibitions more than a year ago, production has not yet begun.

Schneider to Make Tractor

The Schneider Co. at Le Creusot, the biggest armament and general engineering concern in France, has secured a predominating control of the Brasier Automobile Co. It is intended, under the new management, to continue work on the new Brasier factory at Grenoble, where the four-wheel drive Pavesi tractor will be built. This factory was begun during the war by a group of French automobile manufacturers, and was used by them for the production of aviation engines. As hydroelectric power is readily and cheaply obtained in this district, it was decided to extend the works after the armistice and undertake tractor construction. The Pavesi machine is of Italian origin, and is now being built at Grenoble under license. The French car department has approved this type of tractor and has placed orders for a certain number.

The Zebre Automobile Co. being in financial difficulties, a meeting has been called to consider the advisability of either winding up the concern or reorganizing it under new management.

Recall Dealer's Sales Rights

The automobile department of the French company of Gaston, Williams & Wigmore has practically ceased to exist. This firm had exclusive selling rights for Voisin cars, a monopoly of the sale of G. N. cyclecars on the Continental market, and through its subsidiary company, Gaston, Ltd., had the Citroen exclusively in Great Britain.

Voisin has decided to do his own marketing. The commercial service of the G. N. cyclecar is being handled by the Salmson company, builders of this machine, and Citroen will very shortly open up his own English selling organization. Voisin is completing tests of a high-grade 12-cylinder automobile, which probably will be uncovered to the public at the next Paris show.

Daimler to Re-enter French Car Market

PARIS, Feb. 18 (*Special Correspondence*)—The arrival of directors of the Daimler Motoren Gesellschaft of Stuttgart of this city leads to the belief that the leading German automobile company is about to re-enter the French market. The German Daimler Co. possesses handsome showrooms in the Avenue des Champs-Elysees, Paris, and is entitled to take possession of them. At the present time these buildings are being used temporarily by a philanthropic organization for the benefit of French soldiers. The Daimler workshops and spare parts depots, at Suresnes, in the suburbs of Paris, were pulled down during the war and the ground used for an extension of the French arsenal.

Up to the present no German automobile firm has sought to get on the French market by direct representation. The Benz Co. of Mannheim has a dealer in France, but he has not yet received cars for sale. The Bosch Magneto Co. of Stuttgart has a selling organization in Paris and is doing a small amount of business in magneto and lighting sets.

Report Ford Has Sold Canadian Interests

DETROIT, March 10—Confirmation is not obtainable of a report that Henry Ford has sold his Canadian interests for $4,000,000. The report has it that the sale includes rights in all British possessions except England, Scotland and Wales. Neither Henry Ford nor Edsel Ford could be reached to discuss the report.

United States Ships 1516 Cars to Belgium

Exports for Year Surpassed Only by France—Higher Tariffs Urged for Protection

BRUSSELS, Feb. 15 (*Special Correspondence*)—In 1913 Belgium imported 1100 automobiles and exported 3100. During 1920 the imports were 4468 complete cars and chassis, and the exports 1729 cars and chassis. France did the greatest volume of business with Belgium, the number of vehicles being 1647, composed of 1061 complete cars and 586 chassis. America came a close second with a total of 1516, of which 1380 were complete cars and 136 were chassis. Germany sent 528 automobiles into Belgium last year. Great Britain was Belgium's best client, for during the year she took 352 complete cars and 256 chassis. Holland was the next best customer.

	Exports from Belgium		Imports into Belgium	
Country	Complete Cars	Chassis	Complete Cars	Chassis
Germany	7	20	466	62
United States	4	3	1380	136
France	95	62	1061	586
Great Britain	352	256	120	38
Italy	2	7	235	234
Spain	127	..	..	..
Holland	225	..	55	..
Portugal	134	..	..	..
Other countries	253	191	87	8

The Belgian industry is divided, at the present time, into two hostile camps. Importers, for the most part representing French and American firms, are using all their influence to prevent the Government increasing the import duties on automobiles, while the manufacturers are sparing no effort to get Government protection, in the form of increased duties, against foreign competition. The present Belgian import duty is 240 francs per 100 kilos, compared with 80 francs before the war.

Manufacturers claim that as the weight of cars has not increased, while their value has tripled at least, the percentage is no higher now than it was in 1914. A high-class foreign car catalogued at 30,000 francs pays about 2400 francs import duty, being equivalent to 8 per cent of its value, which is the same percentage as in pre-war days. On this account the manufacturers of Belgium claim that they should be given a 45 per cent ad valorem import duty.

A Government decree on this subject is now in preparation, but it is not known whether the new duty will be 33⅓ per cent, as in England, or 45 per cent as in France.

INDIA INCREASES CAR TARIFF

WASHINGTON, March 8—According to a cablegram from Consul General A. W. Weddell, Calcutta, under date of March 1, the Government of British India has increased the duty on automobiles from 7½ per cent ad valorem to 20 per cent, effective March 1.

Many Plants Place Orders for Parts

Hold Over Shipments Released for Delivery—Better Action on Payments

NEW YORK, March 7—Indisputable evidence of improvement in business conditions was given at meetings of groups A and B of the credit department of the Motor and Accessory Manufacturers Association held on the same day at Cleveland and New York. Upon request from headquarters, members attending were prepared to give information regarding the placing of new orders, release of shipments on old orders, collections as compared with the previous month and production of cars. It was disclosed at the two meetings that the following manufacturers have placed orders for new material in varying quantities:—

O. Armleder Co.
Briscoe Motor Corp.
Jas. Cunningham Son & Co.
Dort Motor Car Co.
Elgin Motor Car Co.
Ford Motor Co.
Franklin Mfg. Co., H. H.
Gardner Motor Car Co.
General Motors Corp. (Buick Div.)
General Motors Corp. (Cadillac Div.)
General Motors Corp. (Sheridan Motor Car Co.)
Gramm Bernstein Motor Truck Co.
H. C. S. Motor Car Co.
Haynes Auto Co.
Hendee Mfg. Co.
Hupp Motor Car Corp.
International Motor Co., Inc.
Lincoln Motor Co.
Locomobile Co.
Maxwell Motor Co.
Moon Motor Car Co.
Nelson Motor Car Co.
Reo Motor Car Co.
Studebaker Corp.
Stutz Motor Car Co.
Yellow Cab Mfg. Co.

Releases of shipments on old orders were reported as being received by members from the following:

Acme Motor Truck Co.
Auburn Auto Co.
Autocar Co.
Briscoe Motor Corp.
J. I. Case Threshing Machine Co.
Chandler Motor Car Co.
Chevrolet Motor Co.
Cleveland Automobile Co.
Commercial Truck Co. of America.
Day-Elder Motor Corp.
Diamond T Motor Car Co.
Dodge Bros. Inc.
Ford Motor Co.
Franklin Mfg. Co., H. H.
General Motors Corp. (Buick Div.)
General Motors Corp. (Cadillac Div.)
General Motors Corp. (Oakland Div.)
General Motors Corp. (Olds Div.)
Graham Bros.
Grant Motor Car Corp.
H. C. S. Motor Car Co.
Hudson Motor Car Co.
Hupp Motor Car Corp.
Liberty Motor Car Co.
Lincoln Motor Co.
Locomobile Co.
Mercer Motors Co.
Moon Motor Car Co.
Nash Motors Co.
National Motor Car & Vehicle Co.
Northway Motors Corp.
Packard Motor Car Co.
Pierce-Arrow Motor Car Co.
Reo Motor Car Co.
Standard Steel Car Co.
Stevens-Duryea, Inc.
Studebaker Corp.
Templar Motors Co.
Walker Vehicle Co.
Ward Motor Vehicle Co.
White Co.
C. H. Wills & Co.
Yellow Cab Mfg. Co.

The quantities reported in both instances vary quite materially, as do the number of members with whom new orders or releases have been placed.

A report prepared by C. A. Burrell, manager of the credit department, says:

"As regards payment of accounts to our members, there seems to be comparatively little change from their experiences during January. In but few instances are accounts being paid in full, when due, or even for some time after due date. In the great majority of instances paper is being offered in settlement of accounts and being renewed in whole or in part when it becomes due. There does, however, seem to be a tendency to take care of accounts, either by partial payments and note or by all paper, somewhat more promptly than during the last few months.

"Members of the groups generally report a better condition of affairs than existed before the first of the year, and the prevailing tone seems to be more optimistic. Reports made by those who have endeavored to arrive at a percentage seem to indicate that business is ranging about 20 per cent to 33-1/3 per cent of what might be considered normal, though the latter figure is probably somewhat high.

"Labor conditions show no material change. Manufacturers in many instances are doing their level best to furnish as much employment as possible for their help, in some cases alternating between different groups of employees in an effort to satisfy all as nearly as possible."

Zeppelin Negotiates for French Financing

NEW YORK, March 4—Advices from London say that great indignation has been aroused in Germany by the report that negotiations are in progress for a French company to acquire a controlling interest in the Zeppelin company.

In the course of an interview, Director Coleman of the Zeppelin company states that his company reluctantly arrived at the conclusion that it can no longer exist as a purely German enterprise, and that it was essential that it should be converted into an international organization.

With that end in view he admitted he was in negotiation with a French company in Paris, but the negotiations have not yet advanced beyond the preliminary stage.

A. E. A. TO MEET MARCH 30

CHICAGO, March 7—The Automotive Equipment Association has called a meeting of its directors and membership committee to be held at the Congress Hotel, March 30 and 31. The meeting will be equally divided between jobbers and manufacturers, and separate sessions will be held to confer on questions of interest to them, after which a joint session will be held to discuss constructive measures. Questions taken up in a preliminary way will be further discussed at the June meeting.

Moock Seeks Ideas on Car Chautauqua

Manufacturers' Aid May Be Asked to Defray Expenses of Dealer Education

ST. LOUIS, March 7—A motor vehicle Chautauqua to educate small town dealers in all phases of their business has been proposed by Harry G. Moock, general manager of the National Automobile Dealers Association, and he is now getting the ideas of leaders in the industry on the subject as well as gathering data which would be of value in putting his plan into effect.

It is Moock's idea that there are thousands of dealers in the smaller towns who never have had a chance to learn the most modern methods of conducting their business, such as cost systems and the latest idea in salesmanship. He proposes to hold sessions of the Chautauqua at the principal distributing centers and make the sessions available to all dealers upon the payment of a nominal fee which would insure their interest in the courses provided.

If the plan is put over, a faculty of experts in all branches will be provided for the traveling university. They would be qualified to teach service, accounting and selling. Their lessons would bring out the most advanced ideas in all branches of the business and it is believed dealers would get knowledge and ideas which would prove invaluable to them.

No definite plan has been worked out for financing the project, but it is believed the manufacturers would be sufficiently interested in the project to help defray the expenses. The returns they would receive from the increased selling ability of their dealers, it is believed, would recompense them many times over for any expenditure they might make in this direction.

DEALERS DISCUSS CONTRACTS

MACON, GA., March 4—Dealer contracts and franchises under which they sell automobiles and motor trucks comprised one of the principal subjects discussed at a meeting here of automobile dealers from 20 Georgia counties surrounding Macon. An open discussion relative to plans and methods of selling used motor cars was also an important feature of the meeting, the dealers of the various towns exchanging their ideas.

NAME FINANCE DIRECTORS

BOSTON, March 5—Complete new directorates for the Mutual and Commercial Finance corporations, the automobile finance companies promoted by the H. V. Greene Co., have been elected at adjourned annual meetings of the two concerns. The new directors are Patrick F. Sullivan of Lowell, Samuel L. Powers, Gen. John H. Sherburne, George A. Rich and Guy W. Currier. Arthur R. Stubbs was elected treasurer.

Tax Removal Helps Ontario Business

Demand for Cars Follows Removal from Luxury Classification—Reserve Stocks Low

TORONTO, March 8—The motor business in this city and throughout the Province of Ontario has improved perceptibly during the past month. January business was not more than 60 per cent of January, 1920. The selling season here opened in February and this year the open winter has been a needed stimulant.

One factor that has contributed to stimulation of sales was the removal of the luxury tax, which removal is equivalent to a very pronounced price reduction. On the Cadillac touring car the removal of the luxury tax has reduced the price from $7,300 to $6,475. On a Chevrolet model 490 the reduction is approximately $125. The reduction of the Roamer touring car is from $5,875 to $4,950. Some of the Ontario distributers have been compelled to absorb the luxury tax as they had paid it on cars purchased but which were not sold when the tax was removed. In some instances the manufacturers have shared the absorption of the tax with the dealers on a fifty-fifty basis.

The Toronto dealers were not overstocked with cars when business opened in February. Recently Cadillac sales have been 60 per cent of a year ago on closed cars, and 40 per cent on open cars. In February Franklin business approximated 50 per cent of normal. Motor trucks started selling in February, the comprehensive highway program which has been under way for two years serving as a good stimulant. The Packard branch has made recent sales to industrial organizations, as well as to organizations engaged in highway construction.

The Hyslop organization, selling Cadillacs for the province, and also having a large accessory department with salesmen traveling all of Ontario, has found accessory business is approximately 100 per cent. Increased sales effort has been necessary to keep it at this figure.

Expect 65,000 Output in 1921

Robert H. Combs, operating the Prest-O-Lite Co. of Canada, Ltd., and the National Carbon Co., which manufactures Prest-O-Lite batteries for Canada, and Columbia dry cells, estimates that 80,000 motor cars were built in Canada in 1920, and that Canada has factory capacity for 150,000 automobiles per year. The production of Canadian factories for 1921 is problematic but Combs believes it will approximate 65,000 vehicles, which is 15,000 less than last year.

The leading factories producing in Canada are Ford, McLaughlin, Chevrolet, Willys-Overland, Grey-Dort, Studebaker, Maxwell, Briscoe, Chalmers, and two smaller concerns. Ford has capacity for approximately 100,000 cars per year, and estimates on the capacity of some of the others are: Grey-Dort 15,000; Chevrolet, 12,000; McLaughlin, 10,000; Willys-Overland, 10,000; and Studebaker, 3500.

There are in Canada four truck manufacturers with whom business is slow.

The Prest-O-Lite Co. of Canada, and the National Carbon Co. are located in a new factory finished a year ago. It is a modern plant in every respect, fitted with production machinery. The dry cell factory is working at 100 per cent and the starting and ignition battery department at 40 to 50 per cent.

The tire business in Canada has been slowed down practically the same as in the United States. This applies to the Goodyear Tire & Rubber Co., the Dominion Rubber System, which is the United States, Dunlop Tire & Rubber Co., and the Gutta Percha Rubber Co. Firestone is building a new factory in Hamilton.

Durant to Try Out Experimental Cars

NEW YORK, March 8—W. C. Durant expects to have completed by the last of this month the experimental cars which will be given thorough tests before they are put in production by Durant Motors, Inc. No details regarding them have been made public but it is understood there will be two models, the lower priced of which will sell at less than $1000.

While many cities are hoping they will get one of the Durant factories no statement in regard to locations has been made since the decision to locate one in Flint and another on the Pacific coast. Even the Flint site has not been settled upon.

Durant Motors stock is now quoted on the curb market at around 20 and it is understood there will be another issue of 100,000 shares of no par value common at $20 a share.

Production and distribution personnel are being built up. The latest announcement is that Roland T. Meacham of Cleveland has been appointed Ohio representative.

Receiver Seeks Consent to Forge Company Sale

CLEVELAND, March 7—Creditors and stockholders of the Forest City Machine & Forge Co. have been directed to show cause March 19 why the receiver, Francis W. Treadway, should not sell all the assets of the company to I. T. Kahn of Cleveland who has offered $300,000 for them. An appraisal made last June fixed the value of the assets including land, buildings and machinery at $740,802.

The total liabilities of the company are $352,195. There is a first lien of $57,500 against the property on the purchase price of the land as well as a mechanics lien for $14,462 and receiver's certificates amounting to $15,000. If Kahn's offer is accepted, there will be about $200,000 for distribution among the creditors. The receiver states that all attempts at reorganization have failed and that he has been unable to get any other offer for the property.

Congress Condemns Army Car Purchases

More Assertions of Wasteful Methods Made—Attack Contracts Recently Signed

WASHINGTON, March 8—Bitter partisanship marked the final report of the House Select Committee on Expenditures in the War Department, in which the policy pursued by the Secretary of War in the purchase and sale of automotive equipment used by the American Expeditionary Forces is condemned. The Committee contended that its inquiry "shows the power wielded by the motor industry, or a part of it at least, through the War Industries Board, was disadvantageous to the interests of the Government in time of war."

The majority report charges that material worth millions of dollars was wasted and misapplied, that the War Department failed to provide adequate motor equipment for the overseas forces, that thousands of automobiles and trucks were wrecked because of the lack of spare-parts, that tires valued at from $3,000,000 to $20,000,000 were left to rot at one place alone, that no American-built tanks reached the front, and that the War Department paid excessive sums for motor equipment. The Graham Committee denounces the policy pursued by the Secretary of War in still purchasing trucks.

The Graham Committee was divided along party lines. The minority report contends that the report of the majority is biased, erroneous, and totally misleading. They point out that mistakes were inevitable in the great war and that the majority gives no recognition to the accomplishments of the Army. The minority claims that "the majority ignored the fact that it is in evidence in the record that the shortages (in motor transport equipment) were primarily due to the lack of adequate sea transportation."

In this public denouncement which the committee will undoubtedly spread broadcast, an attack is made upon the Secretary of War for his approval of an order in February, 1920, over the objection of the Quartermaster General, for the purchase of 75 trucks, known as the "Militor," at a cost price of $8,000 each, totaling with additional tires and spare parts, $726,000.

The committee further insists that the War Department "has paid out to the Militor corporation a total of $1,280,213 for 75 trucks, whereas the same company offered to produce 500 trucks for only $274,000 more. Eighty-one Militor trucks are to cost $2,063,903.20.

LOUISVILLE STARTS SALES

LOUISVILLE, March 7—Though sales during the week of the thirteenth annual automotive show were about 50 per cent less than last year, according to conservative estimates, they have increased since the close and a general revival of trade is in progress.

February Production Shows Large Gains

Shortage of Materials in Two Factories Prevents 40 Per Cent Increase

DETROIT, March 9 — Indisputable evidence of the upward trend of the automotive industry is reflected in the step-up in production in Detroit territory during February as compared with January, reports showing a total production in February of 53,040 against 14,615 the previous month. These figures include 31 factories in Detroit and Michigan, and Willys-Overland and Knight plants in Toledo.

What appears to be an increase of approximately 38,000 in the February figures, includes Ford production in Highland Park and branches, totalling 35,000 cars and trucks, about 10 per cent of which were trucks. With the Ford figures eliminated, increase in February was 3425. Ford figures were not included in the January totals because the Highland Park plant was closed, although, according to a statement by Henry Ford, approximately 30,000 cars and trucks were assembled in the assembly branches.

The increase was general throughout the territory, though sharp decrease has been noted in the figures of two of the largest producers, due to various causes. This prevented what otherwise would have been an increase of about 40 per cent in production over January. The instances of decrease were not due to recession in demand, but rather to lack of certain materials, lack of complete working organization due to employees having left when depression became acute, unbalanced inventories which forced certain departments to remain idle while others were working steadily, and similar handicaps brought about by the long period of depression.

March to Extend Increases

That March production will be far ahead of February, with all indications pointing to steady improvement, is certain, in the opinion of leading manufacturers who already have started out on greatly increased schedules. Studebaker plants, which were building 525 of the larger cars in the Detroit plant each week during the first part of February, closed the month with a total in Detroit of 2500 and started in March 1 on a schedule of 665 weekly. The plant has not taken all the men back, but rather increased working time to five days a week instead of four. A schedule of five and a half days will be entered on April 1.

Paige production in February jumped to approximately 63 per cent of normal, and the plant is now operating on a 75 per cent production basis, or about 72 cars daily, according to President H. M. Jewett. The big demand for cars, Jewett said, necessitates a gradual step up until it will be the greatest output in the company's history by April 1. It is expected to hit normal, 90 to 100 cars daily, in a few days. Paige is building trucks only on orders, though Jewett reports the truck end as "showing signs of life."

Packard reports good sales demand, and they are adding to the working force each day. Vice-President Roberts says trucks are moving and activity in that end will increase steadily. The company produced about 30 per cent of normal in February. The Dodge plant is still down and officials have not announced the opening date.

Reo is again working 4000 men full time and 1000 half time. The plant built about 2100 cars and speed wagons during February in ratio of three speed wagons to one car. The company is now producing about 75 per cent of normal—approximately 120 daily.

Hupp built about 700 cars in February and has started on a schedule of 1000 for March. Officials report a steady improvement.

Buick is working 65 per cent of the normal force full time and building about 200 cars daily. One thousand seven hundred cars went to owners in January and 2900 cars in February, with prospects for March of double that total, according to A. B. Batterson.

60 Per Cent for Olds

Olds built about 60 daily in February, chiefly smaller cars. This work jumped to 90 daily, yesterday's output, which is about 60 per cent of normal. Dort is moving conservatively, and while dealers report many prospects and improved actual demand, production will be increased slowly and in keeping with sales. The company built 700 cars in February.

Chevrolet is working a full force part time and during February produced around 85 cars daily.

The Hudson-Essex February output was about 15 per cent of normal.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for January, 1921, and Seven Previous Months

	Month of January				Seven Months Ending Jan.			
	1920		1921		1920		1921	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	2	$29,180	17	$114,775	36	$162,480	53	$216,955
Airplane Parts..	..	43,060	..	24,499	..	215,266	..	108,310
Commercial Cars	1,720	2,726,264	1,561	2,516,639	9,785	19,555,452	14,406	24,543,916
Motorcycles	2,398	664,288	4,322	1,473,390	16,365	4,513,391	29,101	6,529,051
Passenger Cars.	8,004	8,977,926	5,819	6,893,541	48,203	52,523,854	73,007	90,311,365
Parts, not including engines and tires.....	..	4,649,192	..	9,679,295	..	27,337,219	..	52,272,843

Engines

	Month of January				Seven Months Ending Jan.			
	1920		1921		1920		1921	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas.	3,259	$539,269	231	$65,691	20,867	$3,145,669	9,007	$1,641,046
Marine, gas.....	657	1,826,497	792	307,466	5,339	1,912,586	4,858	1,863,063
Stationary, gas..	2,058	291,821	2,707	612,842	15,562	2,096,982	19,675	3,684,035
Tractor, gas.....	1,678	1,481,949	1,578	1,730,974	10,175	9,124,933	12,368	12,035,004
Total	7,652	2,495,536	5,308	2,716,973	51,943	16,280,170	45,908	19,223,148

Banks Would Combine All Willys' Interests

NEW YORK, March 9—Bankers' committees for the Willys Corp. and the Willys-Overland Co. are working together to adjust the closely interwoven affairs of the two companies. Considerable progress in this direction already has been made. While the greatest reticence is maintained, it is understood that nine-tenths of the bank creditors already have agreed to an extension of time for the payment of loans. In the case of the Willys Corp. this extension would carry maturities to May 1.

While the banking interests identified with the two companies are by no means identical, it is understood that they are in practical agreement on what should be done. So far as can be learned, their program calls for a consolidation in one corporation of all the interests with which John N. Willys is identified.

No More Mails for Car Speed Contests

WASHINGTON, March 9—Automobile manufacturers and dealers staging speed and endurance contests in the transportation of mails will not be permitted to carry postal matter without advance authority in each case from the Post Office Department. An order was issued here to-day by Otto Praeger, second assistant postmaster general, advising postmasters throughout the country that no dispatches of mail matter for tests or experimental purposes involving automobiles, airplanes, or other vehicles will be permitted without special authority.

Complaints have been made to the Postmaster General that persons presenting themselves to be employees of the postal service have applied to postmasters for mail matter to be dispatched on certain test trips of automobiles, and also for mail equipment.

INDUSTRIAL NOTES

Dwight P. Robinson & Co., Inc., engineers and constructors of New York, has opened branch offices in Montreal in the Dominion Express Building. Alexander C. Barker, vice-president, is in charge of the office.

Hunter Motor Car Co., which recently purchased a site at Harrisburg, Pa., will begin production of passenger cars about July 1.

Auto Specialties Co., St. Joseph, Mich., has bought the patents of the Burgess Shock Absorber Co. and, after completing improvements of the plant, will enter upon the manufacture of shock absorbers.

American Broach & Machine Co., Ann Arbor, Mich., is building an addition which will permit of employment of 60 men in addition to the present factory force of 40.

Independent Pneumatic Tool Co. has moved the location of its Pittsburgh office to 718 Bessemer Building.

Michigan Copper & Brass Co., Detroit, is working on a production 15 per cent of normal.

A. C. Mannweiler Lamp Co., Fort Wayne, Ind., has changed its name to the Anthony Wayne Lamp Co. and has moved to a new location. Additional equipment has been installed and the company is now in a position to manufacture large lamps of all types.

Rauch & Lang Occupies New Chicopee Factory

SPRINGFIELD, MASS., March 4—Rauch & Lang, Inc., now are settled in their new factory located on a 14 acre tract at Chicopee Falls. The plant is entirely new and was built and equipped especially for the manufacture of the Rauch & Lang electric automobile. It has approximately 100,000 ft. of floor space on one floor of brick and steel saw tooth construction with an open area 30 x 32 ft. between posts. Construction engineers have declared the plant one of the best in the country for the manufacture of automobiles.

Bodies are being built by the Baker Rauch & Lang Co. of Cleveland, but the chassis parts are being manufactured almost entirely at Chicopee Falls. The company reports that the number of orders coming in exceeds expectations and it looks for a good spring business.

Dodge Power Plant Ready for Service

DETROIT, March 4—The new $3,500,000 power plant, one of the units in Dodge Brothers $8,000,000 expansion plan, has been completed. The power plant was built by the Dodge Brothers construction department entirely and safeguards the factory against future emergency such as the breakdown of the Detroit Edison plant last year, upon which practically all Detroit factories were dependent. The power plant is designed for an installed capacity of 40,000 K. W. and requires approximately 25,000 gal. of water a minute for each 10,000 K. W. unit.

In the absence of a natural water supply near the factory or space sufficient for establishing a cooling reservoir, it became necessary for Dodge Brothers engineers to construct a water tower 146 ft. long, 32 ft. wide and 104 ft. high. This mammoth tower is capable of cooling 18,000 gal. of water a minute from a temperature of 105 to 85 degrees when the outside temperature is 72 degrees and the relative humidity 60. It makes possible the repeated use of the same supply of water with a loss of only 5 per cent due to evaporation. The tower is of substantial type and is capable of withstanding a wind velocity of 90 miles an hour.

Equally remarkable in connection with the power plant is the fact that no coal will be shoveled in and no ashes shoveled out, as everything is to be operated automatically. A car dumps the fuel cargo into a hopper and another car comes along and receives a load of ashes.

Reo Sales Company Wins Appeal in Patent Suit

DETROIT, March 7—The United States Circuit Court of Appeals for the second circuit has handed down a decision in a suit brought by William Barber against the Otis Motor Sales Co. of Utica, N. Y., declaring that the valve gear used in automobiles manufactured by the Reo Motor Car Co. does not infringe the Barber patent. It was also held that the Barber patent itself was invalid. This litigation has been pending since 1915 when Barber brought suit against the Reo distributor in Utica and won the case under such circumstances that he claimed that the decree of the Federal court of that district was also binding upon the home corporation at Lansing, Mich.

Barber's decree was affirmed by the United States Circuit Court of Appeals, but Barber then started suit against the Reo Motor Car Co., Inc., of New York, evidently under the misapprehension that it was the parent company whereas it is only a sales organization. In this case he sought an injunction against the exhibition of Reo cars at the New York automobile show in 1917.

The New York suit was decided against him and the Michigan suit was deferred pending the outcome of the litigation in the east. In view of the apparent conflict between the two Federal courts in New York City, the Court of Appeals sent the Utica case back for a new trial. The new trial was given in January 1918 and on May 20 the Federal Court of Utica again sustained the Barber patent. The defendant again appealed and the decision of the Circuit Court of Appeals in its favor is the result.

U. S. TRUCK GUARANTEES PRICE

CINCINNATI, March 4—The U. S. Motor Truck Co. has guaranteed its prices against decrease until July 1. This announcement was contained in a letter addressed to all distributers, dealers and salesmen. The announced purpose of the company is to do its share in stabilizing the automotive industry.

METAL MARKETS

STEEL producers, with few exceptions, feel very much like the man who prepared a sumptuous feast only to have the guests whom he had bidden to his festive board disappoint him. For weeks and weeks the "independents" had been carving prices in the hope that they would bring out a crush of buyers. When the latter failed to materialize, at least one of the "independents" became sufficiently disturbed to announce an upward revision of prices "to meet those of the U. S. Steel Corporation." For all that, it is admitted in all quarters of the steel industry that further downward readjustment of values is certain to come in due time. It is deplorable, however, that orderly progress in this direction is being retarded by what old-timers in the steel market call the chronic aversion of buyers to placing orders in a declining market. It is quite possible that steel prices will present still more of a crazy quilt in point of variation between the different interests before liquidation in production as well as in values has run its full course. This liquidation, which has not yet been completed in steel, appears to be an accomplished fact in the pig iron market, where output of merchant furnaces is now less than 40 per cent of capacity. In the Middle West, strikes in union foundries are impeding the quickened flow of pig iron from blast furnaces to foundries, but in spite of this untoward factor and the light melt of open shops, an improvement in foundry demand is noted. Inquiry for sheets, perhaps the best barometer of conditions in the automotive industries, is improving very slowly but steadily. There has been much more activity in the market for sheet bars, non-integrated sheet mills that cater to the automotive industries and that depend for their supply of bars upon other mills now being in a position to buy at prices permitting them to compete with more chances of success for sheet business. The aluminum market remains dormant so far.

Pig Iron—Several inquiries for foundry and malleable iron from automotive foundries are in the market. Prices appear to have reached very near bottom. Recent Interstate Commerce Commission decisions, refusing suspension of higher freight rates on ores from certain mining points to Lake Superior ports, make it doubtful whether the generally looked for cut in ore prices can be made such as to lessen iron production costs materially.

Steel—Sheet bars are reported to have been sold at as low as $35. Offers of wire rods at $47 failed to find buyers. So far there has not been sufficient fresh inquiry for cold-rolled strip steel from automotive sources to bring about the establishment of a dependable market level under the changed order of things, but cold-rolled strip steel producers are in a flexible mood of mind, and, when business in worth-while tonnages is once offered, surprisingly low prices will be forthcoming as the result of genuine competition. Sheet prices continue in a state of flux, but sheet mills specializing in highly finished automobile sheets are anxious for orders.

Aluminum—Virgin ingots, 98 to 99 per cent, have been offered in the "outside" market at as low as 23c. The market is decidedly a buyers' affair.

Copper—Strenuous competition has set in between two of the leading interests and, as a result, 12½c. has become merely a basis for cutting under when business offers.

Lead—Following sales at as low as 3.75c., the market strengthened and 4c., New York, is now an inside price. Foreign competition has been eliminated.

FINANCIAL NOTES

Hayes Mfg. Co. reports a loss of $189,328.28 for 1920 in the report as of Dec. 31. This, with other deductions, wiped out the surplus and leaves a deficit of $129,936.54. The company had a surplus of $142,770.33 at the beginning of the year, from which preferred dividends of $59,468 and common dividends of $22,500 were deducted. Current assets Dec. 31 amounted to $1,109,112.25, of which $1,002,920.34 is credited to inventories calculated on market value. Current liabilities total $191,955.40. Accounts payable were $97,614.61; accounts receivable, $98,541.01, and cash on hand, $10,150.70. Reserve for depreciation was $392,106.68. President H. H. Smith reported the shutting down of the plant had proved disastrous.

Motor Wheel Corp. report as of Dec. 31 shows total assets of $9,629,942.29. Current assets of $4,479,381.74 include inventories on hand and in transit of $2,891,822.48; notes and accounts receivable, less reserve, $868,385.66; Liberty Bonds, at market value, $54,114.85, accrued interest $2,429.87; cash and short-term bankers' acceptances $662,628.88. Current liabilities include accounts payable, $79,785.96; accrued wages, $46,699.47; accrued local taxes, $26,037.01; provision for Federal income and profits tax, $112,035.74.

Michigan Stamping Co. reports sales totalling $4,804,143.56 and profits of $441,456.06 in its annual statement. Total assets are listed at $4,352,881.19 and surplus is $316,974.71. Accounts payable total $159,892.08; accounts receivable, $664,195.64; Government bonds are listed at $172,886, land contracts at $143,487.92 and inventories, $1,346,679.85.

Stromberg Carburetor Co. has passed the quarterly dividend on common stock. The company paid a dividend of 50 cents in the December quarter. Net profits for 1920 operations, after all allowances, were estimated at $410,000, or $5.45 a share, on the 75,000 shares of capital stock outstanding.

Wire Wheel Corp of America reports net sales for 1920 as $3,234,100, as compared with $2,885,474 in 1919. Profits before deductions for patent depreciation and dividends amounted to $485,825, all Federal taxes and other depreciation being deducted. The balance sheet shows a surplus of $1,563,686.

Acason Motor Truck Co. will increase its capital stock $150,000 by the issuance of 8 per cent cumulative preferred stock in denominations of $10 a share. The issue will be disposed of through the company's connections to eliminate orokerage charges.

Atlas Drop Forge Co., Lansing, Mich., reports earnings in 1920 of $364,311.37 and total assets $935,174.07, with current assets $689,215.67. Inventory is given as $86,673.81 and reserves on Federal taxes $131,468.21.

Continental Motors Corp. has passed the quarterly dividend on its common stock due at this time. In the last quarter a dividend of 1 per cent and in the previous three-quarters 2 per cent was paid.

Hendee Mfg. Co. has declared a regular quarterly dividend of 1¾ per cent on preferred stock payable April 1.

BILTWELL LOSS INCREASES

AKRON, March 7—The State Savings & Trust Co. of Akron, and the Merchants National Bank of Massillon, receivers for the Biltwell Tire and Rubber Co. of Barberton, report a net loss of $40,000 in operating expenses since they assumed control of the plant and were named receivers on July 26, 1920.

The net loss covers the period from July 26, 1920, to February 5, 1921. Assets of the company including materials, cash and accounts receivable, total $150,219.34 and liabilities have increased to $190,504.65. The loss consists principally of contractual obligations for raw materials, and depreciation in inventories, it is stated.

Chandler Sales Gain, Net Profits Fall Off

NEW YORK, March 4—Chandler Motor Car Co. in its report for 1920 shows gross profits of $9,440,000, which compares with $6,650,000 in 1919. Net profits after all deductions amounted to $4,213,000, equivalent to about $15 a share on the 280,000 shares of capital stock. In 1919 profits were $5,652,000, or $26.92 a share on the 210,000 shares then outstanding. The amount reserved for taxes in 1920 is $2,428,250, while the amount written off for inventory depreciation was $736,139. The company also established a loss of $165,702 during the year through the sale of Liberty bonds.

Inventories are carried at $6,524,000 in the general balance sheet as of Dec. 31, 1920, which compares with $4,302,000 in 1919. Cash on hand increased to $940,000 from $66,541. The profit and loss surplus at the end of the year totaled $5,971,000 as against $7,225,000 in 1919. The latter total was figured before allowance for Federal taxes.

Total sales for the year were $38,757,501.89, a gain of about $11,000,000 over the $27,866,967.13 total in 1919, said President F. C. Chandler in his remarks to stockholders. Business prospects for 1921 have shown considerable improvement, he said, since Jan. 1.

JORGENSEN POSITION GOOD

WAUPACA, WIS., March 7—Satisfactory reports on the condition of its affairs were made to the stockholders of the Jorgensen Mfg. Co. at its annual meeting. The assets total $266,397, about half of which is in cash and accounts receivable. The total current liabilities are only $20,581, including a mortgage on the property and unpaid dividends. Charles L. Bryden of Berlin, Wis., and E. H. Jones of Weyauwega, Wis., were elected to the board of directors. F. Jorgensen, C. H. Jorgensen and Julius C. Jorgensen, who have conducted the business of the company since it was organized, were unanimously re-elected.

TO LIQUIDATE INTERLOCKING

AKRON, March 10—The receivership for the Interlocking Cord Tire Co., made temporary by the local courts Jan. 17, has been made permanent, and Elihu Harpham, receiver, has been directed by the court to liquidate the affairs of the concern, which has assets not exceeding $150,000 and liabilities, including judgments held by creditors, exceeding $350,000. Talk of the formation of a new company to take over the plant is being indulged in but it was not regarded as serious by the rubber trade here.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, March 10—The inauguration of Mr. Harding and the deliberations of the Supreme Council in London last week apparently had no significant effects in financial circles. The foreign exchange market was quiet and steady, with a firmer tone toward the end of the week, while the bond and stock markets declined, but only fractionally. The Stock Exchange on last Saturday experienced the quietest day in nearly seven months. Sales for the day at 146,200 shares compared with 126,160 on Saturday, August 14, 1920.

The money market was also quiet, with call money firm at 7 per cent, and with a range of 6 per cent to 7 per cent. While funds were said to be plentiful in the call market, there were, on the other hand, few offerings in the time market, and transactions were light, with rates unchanged from the week before.

Loans of the New York Associated Banks declined $17,782,000, making a total reduction in loans since October 16 of $515,013,000. Excess reserves over legal requirements at $3,983,650 marked a decline for the week of $10,357,330. Net demand deposits increased $21,415,000.

The ratio of total reserves to deposits and Federal Reserve note liabilities combined, for the New York Federal Reserve Bank, was the highest since last September. The ratio was 42.2 per cent, as against 40.5 per cent the week before. Total gold reserves increased $24,994,000, and total cash reserves $23,210,000. Total bills on hand declined $29,847,000, total earning assets $27,855,000, and net deposits $9,389,000.

The Federal Reserve banks as a whole continued the steady progress which was interrupted the week before for the first time this year. Re-discounts declined nearly $45,000,000, to the lowest point for the year. Gold reserves increased $22,777,000, while net deposits declined $34,800,000, and Federal Reserve notes in circulation $9,095,000. As a result, the ratio of gold reserves to Federal Reserve notes in circulation, after setting aside 35 per cent against net deposits, increased from 58.1 per cent to 59.3 per cent.

JOHNSON RECEIVER APPOINTED

SOUTH BEND, IND., March 7—The Union Trust Co. has been appointed receiver for the Johnson Motor Wheel Co., which offered no objection to the appointment. The receiver was directed to carry on operations and to work up the inventory now on hand. The company has a total indebtedness of $200,000, most of it bank and merchandise claims. A creditors' committee was appointed in December and decided to accept notes payable Oct. 1, 1921, providing the company would levy an assessment against the stockholders to raise $125,000. This the stockholders refused to do.

Men of the Industry

Robert S. Wilson who has been manager of the truck tire department of the Goodyear Tire & Rubber Co. has been promoted to the position of manager of the western division with headquarters in Chicago. His territory will cover 10 states. Wilson, is a Princeton graduate, joined Goodyear in 1912. His first work was checking inventories. He became manager of the solid tire department in 1917 and with the advent of the pneumatic tire for trucks, his duties were broadened to include the entire truck tire department.

Harry Wilkin Perry has resigned as general manager of the Trailer Manufacturers Association of America. His resignation will become effective as soon as his successor has been appointed. Perry became manager of the Association when it was organized two years ago going there from the National Automobile Chamber of Commerce where he had served for eight years as secretary of the Motor Truck, Good Roads, Export and Legislative committees.

J. P. Matthews is now in active charge of the Midwest Rubber Manufacturers' Association as secretary and general manager. He was for several years general purchasing agent for the Mason Tire & Rubber Co., during the course of which employment he visited the Straits Settlements to investigate the crude rubber situation.

Robert E. Page who recently has been engaged in field organization work for the Hawkeye Truck Co. and the Nelson Motor Truck Co. and who formerly was in the foreign sales organization of Dodge Bros. has been appointed general sales manager of the O'Connell Motor Truck Co. of Chicago. He will undertake at once the building up of a national sales organization for this company.

N. H. Van Sicklen, Jr., vice-president of the Van Sicklen Speedometer Co., will be in charge of the Elgin, Ill., plant, following its absorption by Stewart-Warner. His first assistant will be Edward McDonough. George Underwood, former superintendent, retires. It has been decided to remove the sales office from Elgin to Chicago.

J. M. Dine has been appointed vice-president and general manager of the Oldfield Tire Co. of Akron. He has been identified with the rubber industry for fourteen years, first with Goodyear and then with Firestone. Other officers chosen were B. M. Robinson, secretary; H. L. Allsopp, treasurer, and M. E. Moffett, assistant treasurer.

R. H. Johnston, who has been vice-president of the White Motor Co. with headquarters in Washington, has resigned, to enter the investment banking business in New York. He formerly was manager of the White branch in New York and president of the New York Dealers Assn.

T. W. Van Sickle, for several years sales representative of the New Departure Mfg. Co., has organized the V-S Sales Co., with office at 856 Penobscot Bldg., Detroit. The company will be direct manufacturers' representatives in Detroit and Michigan territory.

W. A. Murfey, sales promotion manager of the Standard Motor Truck Co., will handle sales and service on Standard trucks direct from the factory. A large building at the factory has been set apart to house this department, and an expert mechanical staff will have charge of the work.

Harold W. Slauson, who has been in charge of the motor department of "Leslie's Weekly" for the past nine years, has joined the Kelly-Springfield Tire Co. and is in charge of the engineering service department at the main offices, New York.

W. R. Campbell, who has been acting temporarily as treasurer of the Ford Motor Co. has definitely decided not to serve permanently in that capacity and it is understood he will return to the Canadian plant of which he has been in charge for some time.

Howard W. Maxham has resigned as superintendent of automotive transportation with the American Bosch Magneto Corp. to take charge of the maintenance department at the Amesbury, Mass., plant of Gray & Davis, Inc.

W. H. Holmes, advertising manager of the Packard Motor Car Co., has left that organization and will enter the advertising agency field April 1. His resignation was tendered Monday and became effective immediately.

Archibald Black, of the firm of A. & D. R. Black, consulting engineers, Washington, D. C., has been appointed an aeronautical engineer with the United States air-mail service.

H. A. Longshore, vice-president, and Frank B. Wilson, advertising manager of the Climax Rubber Co., Columbus, have established executive offices in New York at 505 Fifth Avenue.

R. T. Walsh, formerly advertising manager of the King Motor Car Co. and later with the Apex Motor Corp., has joined the organization of the Service Corp. in the Detroit branch.

B. Moss McKenzie has resigned as general purchasing agent of the Ford Motor Co. of Canada. He has not announced the reason for his retirement nor his plans for the future.

W. G. Torrance, formerly with the purchasing department of the Timken-Detroit Axle Co., has taken over the sales end of the Lincoln Steel Products Corp., Detroit.

Hubert E. Hartman, assistant secretary and general attorney for the Ford Motor Co., severs his connection, March 15, to enter business for himself.

L. F. Joliat has been made manager of the Detroit branch of the Miller Rubber Co. Joliat comes to Detroit from Cleveland, where he was with the Goodrich organization.

John H. Samuels has been appointed St. Louis district representative for the Midwest Engine Co. Samuels was formerly with the tractor plant of the Moline Plow Co.

C. J. Welch, assistant general sales manager of the United States Rubber Co., has been elected a director of the company.

W. H. Van Dervoort Succumbs to Illness

MOLINE, ILL., March 7—W. H. Van Dervoort, head of the R. & V. industries in East Moline, died at the family home in Moline, after a year's illness. He was 52 years old and for 22 years had been in partnership with O. J. Root his former classmate, in manufacture of gasoline engines and automobiles.

He was born in Ypsilanti, Mich., Feb. 28, 1869, graduated from the mechanical engineering department of Michigan Agricultural College and took post-graduate work at Cornell. He returned to Michigan as instructor and later went to the University of Illinois as assistant professor of mechanical engineering. In 1899 he quit pedagogy to establish the first factory in Champaign. Two years later the R. & V. plant moved to East Moline where it has since been located.

During the war he was a member of the munitions standard board and of the national war labor conference board. In 1919 he was a member of the board of five sent abroad to study industrial conditions in Europe. He had been president of the Society of Automobile Engineers and a member of the committee on management of the American Motor Car Association, which later became the Automobile Chamber of Commerce.

Dayton Section S. A. E. to Discuss Aviation

DAYTON, OHIO, March 9—The Dayton section of the Society of Automotive Engineers will meet March 22 at the Engineer's Club. Four talks on aviation development will be given. G. M. Williams, general manager of the Dayton Wright Airplane Co. will talk on commercial aviation, covering accomplishments in this line since the armistice.

C. F. Taylor, the engineer in charge of the power plant laboratory at McCook Field, will discuss developments in power plants and in fuels which have made possible flights at high altitudes, increase in compression ratios, and increase in engine size and efficiency.

Propeller construction will be treated by F. W. Caldwell, chief of the propeller branch at McCook Field. Lieut. C. N. Monteith, chief of the airplane section at McCook Field, will speak on aircraft design and performance, paying particular attention to the newer phases of airplane construction.

DETROIT COST CHAPTER FORMED

DETROIT, March 4—Detroit Chapter of the Industrial Cost Association was organized at a meeting attended by a score of officials connected with various Detroit plants held at the Tuller Hotel Wednesday. J. W. Stannard of the American Auto Parts Co. was elected chairman; E. M. Brown of the American Blower Co., vice-chairman; and A. Rae DuBell, secretary-treasurer of the Adams X-Ray Co. was named secretary-treasurer.

Waller Crow, secretary of the Schaffer Engineering & Equipment Co., Pittsburgh, spoke briefly in outlining the aims of the association.

A. A. Alles, Jr., secretary and treasurer of the National Association, told of the steps taken thus far and read a long list of executives who were members.

WOULD FIGHT OHIO BILLS

CLEVELAND, March 5—Ohio automobile interests—producer, distributor and retailer—were urged to unite their activities in a common fight to prevent the automobile and truck being taxed off the highways, at a meeting of the Automotive Association of the Chamber of Commerce.

Calendar

SHOWS

Mar. 12-19—Boston, Annual Automobile Show, Mechanics Bldg. and South Armory.

Mar. 14-19—Omaha, Annual Automobile Show, Omaha Automobile Trade Ass'n, Inc., Omaha Auditorium, C. G. Powell, Mgr.

Mar. 14-19—Washington, Annual Automobile Show, Washington Automobile Dealers' Ass'n, Rudolph Jose, Chmn.

Mar. 19-26—Detroit, Annual Automobile Show, Detroit Automobile Dealers' Ass'n, Morgan-Wright Building.

April 3-9—Denver, Annual Automobile Show, Auditorium.

April 4-9—Seattle, Annual Automobile Show, Seattle Motor Car Dealers' Ass'n, Arena Hippodrome.

FOREIGN SHOWS

Mar. 23-28—Witwatersrand Agricultural Show including machinery and motors sections.

April, 1921—Sofia, Bulgaria, Tractor Trials, under the Bulgarian Ministry of Agriculture.

Apr. 20 - May 5 — Mexico City, Mexican Automobile Show, National Theatre Bldg.

May 28, 1921 — Czecho-Slovak International Automobile Exposition of Cars, Trucks, Tractors, Motorcycles and Equipment. Prague.

May 28-June 8—International Automobile Exhibition, Basle, Switzerland.

June, 1921—Reykjavik, Iceland, Agricultural Exhibition—Agricultural Machinery—Icelander Agricultural Society, Reykjavik, Iceland.

Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

Nov. 4-12 — London, British Motor Show, Society Motor Mfrs. and Traders.

CONVENTIONS

May 4-7 — Cleveland, National Foreign Trade Council.

May 17-19—Buffalo, Convention of Factory Service Managers, Auspices of Service Committee, N. A. C. C.

May 24-28 — West Baden, Ind., Summer Meeting Society of Automotive Engineers, West Baden Springs Hotel.

Oct. 12-14. 1921—Chicago Twenty-eighth Annual Convention National Implement & Vehicle Ass'n.

RACES

July 24—Grand Prix, Le Mans.

S. A. E. MEETINGS

Boston section—March 18—Engineers' Club.

Buffalo section—April 19—Paper on "Carbureter Performance," by F. C. Mock.

Dayton section—May 3.

Detroit section—March 25—Discussion of "The Relation Between the Industry and the Department of Engineering Research of the University of Michigan," by Prof. E. A. White. Detroit Board of Commerce.

Metropolitan section—March 16—Paper on "Brakes," by H. G. Farwell. Automobile Club of America.

Metropolitan section—April 14—Paper on "Low Grade Fuel Carburetion," by A. H. Beach.

Minneapolis section — April 6 — Discussion of repair equipment.

Washington section—March 18—Highway and Highway Transport Trading. Cosmos Club.

Washington section—April 1—Aeronautical Engineering Session.

Duesenberg Team Enters for French Grand Prix

PARIS, Feb. 28—(*Special Correspondence*)—By reason of the formal entry to-day of a team of four Duesenberg cars in the French Grand Prix race, on July 25, immense additional interest is given to the French classic. Two of the Duesenbergs will be in the hands of American drivers and two in the hands of Frenchmen, the persons selected, because of their knowledge of local conditions, being Albert Guyot and the amateur driver M. Inghibert. The latter was scheduled to drive a Ballot in the French race, but abandoned this mount in favor of the Duesenberg eight head.

This is the first occasion on which a modern American racing team has lined up in an important European automobile race, and the encounter is looked upon with unusual interest for while the American machines which were sent to Europe fifteen years ago were decidedly inferior, it is admitted that modern American racing cars are capable of holding their own with the best in Europe.

The number of starters in the Grand Prix now stands at 19, as follows: 4 Ballot, 3 Darracq, 2 Sunbeam, 2 Talbot-Darracq, 3 Fiat, 1 Mathis, 4 Duesenberg. There is a possibility of a team of three Italian Itala cars being entered and one each from the Belgian firms of D'Aoust and Abadal.

BRITISH SHOW DATE SET

LONDON, Feb. 25—(*Special Correspondence*)—The Society of Motor Manufacturers and Traders have fixed their car show for the dates Nov. 4 to 12 inclusive. It will be preceded by the French (Paris) show and will be followed in December by the Belgian show. It is not announced whether the British car show will be held at Olympia or, as last time, jointly at Olympia and the White City. A section of the trade would prefer the show to be held solely at the White City rather than in two sections, and there is plenty of space at White City for the complete show.

Mexico Sets Show Date from April 20 to May 5

NEW YORK, March 7—Confirmation that the date of the first automotive exhibition in Mexico City will be April 20 to May 5 has been obtained by EL AUTOMOVIL AMERICANO, the Spanish automotive publication of the Class Journal Co. The show date was originally set to be April 10 to 25 and in an announcement by the Bureau of Foreign and Domestic Commerce the first week in April was given. However, the later date has been finally chosen, as was revealed in the telegram from the show management. Passenger cars, motor trucks, tractors and equipment lines will be exhibited in the new National Theater Building which is being thrown open to the public for the first time. Information from the show management is that practically all of the 45 American cars represented in Mexico City will be exhibited.

AUSTRALIA CUTS WHEEL TAX

OTTAWA, ONT., March 5—Ottawa Trade and Commerce Department is advised that Customs regulations for Australia in regard to motor car wheels have been modified. By the order of the Minister of Trade and Custom there, wheels made expressly for and usable only with motor cars shall be classed for Australian tariff purposes under the item applicable to motor car chassis. The order went into effect Nov. 30. The effect of this order is to reduce the British duty on motor car wheels imported separately or loose, from 40 to 7½ per cent and on Canadian and other wheels from 55 to 17½ per cent ad valorem.

S.A.E. Book New York and Detroit Speakers

NEW YORK, March 7—The Metropolitan Section of the S. A. E. at a meeting on March 16 at the Automobile Club of America will discuss the subject of brakes, H. G. Farwell reading the paper. An invitation is extended to all members of the industry to attend the meeting, which will be preceded by a dinner at the clubhouse at 6.30 p.m.

After the discussion of Farwell's paper, a moving picture film produced by the Bantam Ball Bearing Co. will be shown. This company was among the first to solve its industrial troubles through co-operation between the management and the employees. The success of the company, as a result of this action, which was taken a number of years ago, has caused them to reproduce the episode in the form of motion pictures.

The Detroit Section's guest on March 25 will be Prof. E. A. White, who is at the head of the Department of Engineering Research at the University of Michigan. This department was established to enable the industries to make use of the excellent engineering laboratory facilities of the University and maintain a co-operative connection between manufacturers and technically trained men. This talk will be significant because of the recent decision of the S. A. E. to co-ordinate research work in the automotive industry.

ROTARY TIRE RECEIVER NAMED

ZANESVILLE, OHIO, March 5—Upon the application of Edward O. Sterns and others who are stockholders, B. H. Loveless has been appointed receiver for the Rotary Tire & Rubber Co. C. W. Bryson of Columbus, vice-president of the company, declares that it is solvent and claims that the receivership proceedings were brought in order that certain contracts can be set aside.